Senior 4 Applied Mathematics (40S) Standards Test

Administration Manual for Supervising Teachers

June 2004

Manitoba

Building for the Future

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Manitoba Education, Citizenship and Youth,
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Preface

This *Administration Manual for Supervising Teachers* is distributed to teachers and administrators, and must be read prior to administering the standards test. The rules and guidelines in this manual must be strictly observed to ensure the consistency of standards test administration.

Please use this manual in conjunction with the registration package, the *Policies and Procedures for Standards Tests* handbook and the *Information Bulletin* (these documents are available on our website at: http://www.edu.gov.mb.ca/ks4/assess/publications.html) to gain a full understanding of the protocols and procedures associated with this test. This manual contains general information about the test, step-by-step instructions for each day of the test administration, and policies regarding absenteeism, lateness, violation of rules, etc.

If you encounter exceptional circumstances not addressed in this manual, or if you have further inquiries, contact Carol Chabbert, Administrative Officer, at 945-0747 or toll-free at 1 800 282-8069, extension 0747.

Table of Contents

Page

General Information 1
- Features of the test 2
- Test schedule 3

Policies for Standards Tests 3
- Adaptations 3
- Exemptions 4
- Re-read provisions 4
- Return of tests to students 4
- Test confidentiality 4
- Student materials 5
- Students leaving the room 5
- Late arrivals 6
- Student absences 6
- Responding to student questions 6
- Violation of rules 6
- Damaged or misprinted materials 7
  - On test administration date 7
  - During test administration 7

Responsibilities of School Principals 8

Responsibilities of Supervising Teachers 9
  - Advance preparations 9
  - Prior to test session 10
  - Beginning the test session 11
  - During the test session 12
  - Ending the test session 12
- Submitting materials 15
  - Centralized marking (scored at a central location) 15
  - School-based and classroom-based marking (scored by classroom teacher) 16

Appendices 19
Appendix 1: Inquiry Task Session Rules 21
Appendix 2: Written Test Session Rules 22
Appendix 3: Sample Pre-printed Demographic Data Form 23
Appendix 4: Sample Generic Demographic Data Form 24
Appendix 5: Sample Attendance Form 25
Appendix 6: List of Reason Codes to Record Changes in Standards Test Student Registration Numbers 26

General Information

Manitoba Education, Citizenship and Youth develops all standards tests in collaboration with teachers from across the province. This standards test is based on the *Senior 4 Mathematics: Manitoba Curriculum Framework of Outcomes and Senior 4 Standards (2001).*

The standards test is locally marked and counts for 30% of each student's final grade in the course. Student results on the test will be released to students according to local policy on the date designated by local jurisdictions.

All students enrolled in Senior 4 Applied Mathematics (40S), except those who have been exempted, must write the Senior 4 Applied Mathematics (40S) Standards Test on June 9 and 10, 2004. However, a student may rewrite a mandatory provincial standards test at any regularly scheduled administration without being registered in the course (see *Policies and Procedures for Standards Tests*, Section 3.1).

Marking instructions are provided by the department immediately following test administration. School principals will receive the *Marking Guides* for the Senior 4 Applied Mathematics (40S) Standards Test by June 10, 2004. The *Marking Guides* are to be stored in a secure location until 12:30 p.m. on June 10, 2004.

Students are expected to write the standards test as scheduled near the end of the semester in which they take the course (e.g., January for first-semester courses, June for second-semester and full-year courses).

All schools should receive the test materials by May 31, 2004. The number of test booklets sent to each school is based on the February 20, 2004 registration information provided by the school. Please advise Carol Chabbert, Administrative Officer, at 945-0747 or toll-free at 1 800 282-8069, extension 0747, immediately if the number of students registered to write the test has increased since registration.

Manitoba Education, Citizenship and Youth supports local marking by:

- training representatives from local jurisdictions to act as local marking co-ordinators;
- collecting and scanning all *Answer/Scoring Sheets* (for the Written Test) and *Recording Sheets* (for the Inquiry Task) from jurisdictions to provide them with test result summaries;
- centrally marking a random sample of locally-marked test booklets to provide feedback to jurisdictions on their local marking; and
- providing provincially-funded local jurisdictions with $10.00 for each test administered in accordance with the test schedule noted on the following page and marked locally. The calculation is based on the number of students whose completed marking scan sheets have been received.

Features of the test

- The test is comprised of two components: an Inquiry Task and a Written Test.
- English or French versions of the test are available.
- Students will be allowed to use an 8½ × 11 individually prepared study sheet during the Inquiry Task and the Written Test.
- The Inquiry Task component consists of items targeting two curriculum units of the *Senior 4 Applied Mathematics: A Foundation for Implementation (2000)*. The Test Development Committee considered the inclusion of a new Inquiry Task this year. However, to prepare a quality Inquiry Task and to ensure that all Senior 4 Applied Mathematics teachers are adequately informed, this decision has been postponed one year. A new Inquiry Task will be introduced in the 2004–2005 school year. This school year for both semesters, the two units assessed by the Inquiry Task are Personal Finance and Design and Measurement.
- The Written Test will assess the remaining six curriculum units and will not include items from the two units already assessed by the Inquiry Task.
- The Inquiry Task comprises 25% and the Written Test 75% of the total marks of the standards test.
- The Inquiry Task requires the use of technology such as computer software and/or a graphing calculator.
- The Written Test requires the use of a graphing calculator. Students may use computer software, depending on the tools normally used in the classroom for instruction, as well as the Internet.
- The main characteristic of the Inquiry Task is the investigative nature of the items that require some reflection on the part of the student for problem solving. The Inquiry Task will consist only of constructed-response items that may include restricted-response, restricted-response with explanation and open-response items.
- The Written Test will consist of multiple-choice items as well as constructed-response items.
- Strict administrative procedures, as detailed in this manual, need to be followed by the classroom teacher to avoid any compromise to the integrity of the test.

Test schedule

The following table summarizes the schedule for the Senior 4 Applied Mathematics (40S) Standards Test:

Date	Session	Preparation Time	Activity	Time Required for Test
Wednesday, June 9, 2004	1	15 minutes preparation and instructions	Inquiry Task	2 hours
Thursday, June 10, 2004	2	15 minutes preparation and instructions	Written Test	2.5 hours

The test must be written between 8:30 a.m. and 12:30 p.m. on Wednesday, June 9, 2004 and Thursday, June 10, 2004.

The total writing time is 2 hours for the Inquiry Task and 2.5 hours for the Written Test plus 15 minutes for preparations and instructions before each test session.

Policies for Standards Tests

Principals and supervising teachers should be aware that *Policies and Procedures for Standards Tests* handbook has been distributed to all schools and is also available on our website at: http://www.edu.gov.mb.ca/ks4/assess/publications.html. This handbook outlines current policies and procedures related to the administration of standards tests and reflects the principles and guidelines contained in *Principles for Fair Student Assessment Practices for Education in Canada (1993)*.

Adaptations

Schools are asked to identify and submit requests for test adaptations **at the time of student registration**. These requests should be submitted on the *Request for Adaptations Form* included with the registration package. Following departmental review of the adaptation requests received, schools will be advised of the department's decision regarding these requests (see *Policies and Procedures for Standards Tests*, Sections 4.0, 4.1 and 4.2).

Exemptions

Decisions for student exemptions that fall within the guidelines set out in *Policies and Procedures for Standards Tests* (Sections 5.0, 5.1 and 5.2) are made at the school level and do not require departmental approval. Schools are required, however, to report school-based exemptions on the *Student Exemption Report* included with the registration package. If additional student exemptions are needed after the registration deadline date, an additional *Student Exemption Report* should be submitted as soon as possible.

For exemptions that fall outside the parameters of policy and procedure guidelines, requests should be made **at the time of student registration**. Please submit requests in writing to Wenda Dickens, Acting Director, Assessment and Evaluation Branch, 71–1567 Dublin Avenue, Winnipeg, Manitoba R3E 3J5.

Re-read provisions

As the reporting of individual student scores on locally marked standards tests is the responsibility of each local jurisdiction, the re-read policy for these tests is determined locally. Should a re-read be required for a test booklet that has been sent to the department as a part of the feedback on the marking process, the department will return a photocopy of the test booklet upon request. Please contact Carol Chabbert, Administrative Officer, at 945-0747 or toll-free at 1 800 282-8069, extension 0747.

Return of tests to students

Local jurisdictions decide whether to keep the test booklets or return them to students. The department will return the random sample of test booklets to schools within three months of marking.

Test confidentiality

Test materials must be kept secure and sealed until administration.

After each session, all materials are returned for safe-keeping to the secure area.

Test booklets must not be reproduced nor information from them communicated in any way until test administration is completed.

The *Marking Guides* are to be stored in a secure location until the test administration is complete.

Student materials

Students may use the following materials during the Senior 4 Applied Mathematics (40S) Standards Test:

- HB pencil;
- eraser;
- ruler;
- protractor;
- extra piece of 8½ × 11 blank paper and/or 0.5 cm graphing paper provided by the classroom teacher during the test sessions upon request;
- graphing calculator;
- computer software for either or both the Written Test and Inquiry Task; and
- and 8½ ×11 individually prepared study sheet. NEW!

Students are not permitted to exchange materials during the test.

Access to Internet tools employed in the everyday Applied Mathematics (40S) class is allowed during the test. The same measure applies to student developed templates such as spreadsheets. NEW! Programs downloaded to the TI–83 calculator during the school year are allowed for use during the test.

Please note that students may choose to print their responses from the computer. In such cases, students are to indicate their booklet ID number on each page and remain seated at all times. You are responsible for distributing the printouts to them according to booklet ID number, so they can staple them appropriately to their booklets.

The following materials must **not** be used during the test:

- textbooks and other printed documents;
- subject-related materials; and
- dictionaries or translation resources of any kind.

Students leaving the room

Students are expected to remain in the room for a minimum of 60 minutes from the start of each test session.

Any student who must leave and re-enter the room should be accompanied by a replacement supervisor. This practice ensures that the supervising teacher can remain in the test room with the students at all times.

Late arrivals

Students who arrive more than one hour after the test has started will not be allowed to write the test. Students who arrive late but within the first hour of the test will be allowed to write. In this case, the student will be allowed additional time corresponding to the amount of time by which the student was late.

Student absences

Standards tests cannot be written at a later date. In the event that a student writes the standards test after the official test date, the mark obtained cannot be reported as a standards test result. Therefore, schools have the responsibility to provide a final mark to absent students. The final mark for these students must be identified as a school-based mark only (see *Policies and Procedures for Standards Tests,* Sections 6.0, 6.1 and 6.2, for additional information).

Responding to student questions

Avoid making any directing/guiding comments during the test, other than those required for distribution of materials and instructions to students.

No explanations, translations, rephrasing, clarifying statements or comments of a similar nature may be provided about the test content. Supervising teachers can, however, provide clarification regarding test taking rules or procedures.

If a student asks a question related to test content, a suggested response is, "I'm sorry. I can't answer your question. Do your best with it."

Suspected errors in printing or wording should not be communicated to students unless specific instructions are received from the Assessment and Evaluation Branch. You may however contact Philippe Le Dorze, Assessment Consultant, at 945-0670 or toll-free at 1 800 282-8069, extension 0670 to report any suspected errors.

Violation of rules

The *Inquiry Task Session Rules* or the *Written Test Session Rules* are read aloud to students by the supervising teacher immediately before each session of the test (see Appendices 1 and 2, pages 21 and 22).

Document any violation of rules on the *Supervising Teacher Report*. This documentation should include:

- the test booklet number; and
- a description of the circumstances, including available evidence.

The student may be permitted to complete the test.

The consequences of any violation of rules is a local decision.

Damaged or misprinted materials

Students should be assured that they will not be penalized for any obvious error in printing or wording. Local marking co-ordinators will be advised of any known errors before the marking session. Return the unused damaged or misprinted booklet(s) with the reports and forms being sent to the department immediately after the final test session.

On test administration date

If a damaged or misprinted test booklet is discovered **at the start** of the test session:

- replace the damaged or misprinted test booklet with a new test booklet; and
- print "DAMAGED" on the test booklet cover and on the *Attendance Form*.

During test administration

If a damaged or misprinted test booklet is discovered **during** the writing of the test:

- give the student a new test booklet (the student keeps the damaged or misprinted test booklet until the end of the session);
- instruct the student to continue responding to test items in the new test booklet;
- collect both test booklets at the end of the test session and ensure that both booklets are kept together by bundling with an elastic band;
- cross out the existing booklet number on the new test booklet and change it to the original booklet number so that **all student responses are recorded under the original booklet number**;
- indicate on the *Attendance Form* that two booklets have been used for one student (see Appendix 5, page 25); and
- record the damaged or misprinted test booklet number on the *Supervising Teacher Report*.

Responsibilities of School Principals

It is the responsibility of the principals to ensure that the tests are kept confidential until test administration is completed.

Other responsibilities are listed below.

If tests are not in your school by May 31, 2004, contact Carol Chabbert, Administrative Officer, at 945-0747 or toll-free at 1 800 282-8069, extension 0747.

Use the *Packing List* to confirm that all materials have been received. Count the shrink-wrapped test booklets to ensure that there are enough booklets for the number of students writing the test. Keep the shrink-wrapped test packages unopened until the morning of the test. If additional test materials are needed, immediately contact Carol Chabbert, Administrative Officer.

Please note that the shrink-wrapped test bundles are divided into two packages. The Inquiry Task package should be opened on June 9, 2004, in preparation for the beginning of the Inquiry Task session.

The Written Test package should remain unopened in a secure location until the morning of June 10, 2004, at which time the Written Test will be administered.

Store test materials in a secure area in the school.

Provide supervising teachers with a listing of MET numbers for the students registered to write the test. Call the Professional Certification and Student Records Unit at 1 800 667-2378 to obtain MET numbers for new students.

Make arrangements to meet the requirements of the adaptations approved for your students (see Adaptations, page 3 and *Policies and Procedures for Standards Tests*, Sections 4.0, 4.1 and 4.2).

Co-ordinate test scheduling and space requirements.

Minimize the frequency of school announcements during the test sessions.

Ensure that a replacement supervisor is available to accompany students who must temporarily leave the room.

Provide the test materials to the supervising teacher on each morning of the test.

Complete the *Principal Feedback Form* before the end of the final test session.

Advise the Assessment and Evaluation Branch of school closures or suspended school bus transportation services that occur on the test dates as a result of unusual or extenuating circumstances or inclement weather conditions. Please contact Philippe Le Dorze, Assessment Consultant, at 945-0670 or toll-free at 1 800 282-8069, extension 0670.

- Please note that you will also need to inform the Branch in writing of the unusual circumstances or inclement weather that affected the writing of the Senior 4 Applied Mathematics (40S)—Standards Test. Fax to Wenda Dickens, Acting Director, at (204) 948-2442.

Responsibilities of Supervising Teachers

Supervising teachers administer the test using the step-by-step procedures outlined in the following section.

(✓)	**Advance preparations**
	1. Check with your principal to ensure that:
	– appropriate scheduling and allocation of space for the test has occurred;
	– the test materials itemized on the *Packing List* have been inventoried;
	– a replacement supervisor is available to accompany students who must temporarily leave the room during the test;
	– arrangements have been made to accommodate the adaptations approved for students; and
	– a list of MET numbers for students writing the test is available.
	2. Ensure that all subject-related materials have been removed from the walls and boards.
	3. Notify students in advance of the:
	– time, location and duration of each test session;
	– materials needed to write the test (including the individually prepared study sheet);
	– *Inquiry Task Session Rules* and the *Written Test Session Rules* (see Appendices 1 and 2, pages 21 and 22); and
	– minimum time a student must remain in the test room (60 minutes).
	4. Ensure that you have extra supplies and that there is a functioning pencil sharpener and stapler in the room. Students must not exchange materials during the test. If students print their responses from the computer, they should remain seated. Distribute the printouts to them according to booklet ID numbers identified on each page of the printout.
	5. If there is more than one teacher supervising the test, photocopy the *Supervising Teacher Report*.
	6. Review the sample forms in the Appendices.
	7. Please note that the pre-printed *Demographic Data Forms* already have the students' names and MET numbers and should be distributed accordingly.

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Note: Shaded areas indicate the step is not applicable.

Session 1	Session 2	(✓) Prior to test session
		1. Ensure that you have access to the following test materials:
		– *Packing List*;
		– *Inquiry Task* booklets;
		– *Written Test* booklets;
		– *Attendance Forms* (enclosed with shrink-wrapped test booklets);
		– *Student Registration Update Form*;
		– four extra copies of *Inquiry Task* booklets;
		– four extra copies of *Written Test* booklets;
		– *Demographic Data Forms* (pre-printed and generic);
		– a list of MET numbers for students writing the test;
		– *Answer/Scoring Sheets* (for the Written Test);
		– *Recording Sheets* (for recording marks for the Inquiry Task) (Keep in a secure location and forward to marking site (if applicable) with test materials on June 10, 2004);
		– *Supervising Teacher Report*;
		– *Supervising Teacher Feedback Form*;
		– *Principal Feedback Form* (this must be given to the principal and collected before returning materials);
		– *Administration Manual for Supervising Teachers* (this document);
		– envelope labelled "For the Return of Study Sheets"; and
		– labelled envelope for the return of materials to the Assessment and Evaluation Branch.
		2. Count the number of *Inquiry Task* booklets (Session 1) and *Written Test* booklets (Session 2). The number of test booklets should equal the number requested by the school plus the additional 4 booklets. If you need to split a bundle of booklets between classrooms, make a photocopy of the *Attendance Form*. Adjust each copy of the *Attendance Form* to reflect the booklets being used in each classroom.
		3. Arrange the desks so they are spaced as far apart as possible.

Session 1	Session 2	
		4. Remove the following from the envelope labelled "For the Return of Demographic Data Forms":
		– pre-printed *Demographic Data Forms* in alphabetical order for every student registered to write the test. Ensure that the school name, school code, and MET numbers appearing on the pre-printed forms are accurate (see Appendix 3, page 23); and
		– generic *Demographic Data Forms* for students who joined the classroom after registration, and who are scheduled to write the test (see Appendix 4, page 24). **Note:** Only **one** *Demographic Data Form* should be completed for each student. If a pre-printed *Demographic Data Form* exists for a student, that is the form that should be used. **DO NOT** complete a generic *Demographic Data Form* for that student.
		5. Sort the pre-printed *Demographic Data Forms* for distribution.
		6. Make arrangements per school policy to ensure that students who are exempted from writing the test are accommodated in an alternate setting.
(✓)		**Beginning the test session**
		1. Distribute:
		– *Inquiry Task* booklets;
		– *Written Test* booklets;
		– *Answer/Scoring Sheets*;
		– *Demographic Data Forms* (as needed in Session 2); and
		– the individually prepared study sheets.
		2. Remind students to check that the number on the *Answer/Scoring Sheet* corresponds to the number on their *Written Test* booklet.
		3. Instruct students to write their booklet number in the upper right-hand corner on their study sheet.
		4. Tell students that while they are working you will:
		– be circulating the *Attendance Form* so they can print their names beside their test booklet number; and
		– write the time and location of the next test session on the board.
		5. Ensure that each student receives the correct test booklet by verifying that the test booklet number corresponds to the student name recorded on the *Attendance Form*.
		6. Read aloud instructions for completing *Demographic Data Forms*. The instructions are found on the form itself. Direct students to print and shade in all the information requested. Remind students to accurately record the program (English, French Immersion, or Français) in which they are enrolled.
		7. Collect the *Demographic Data Forms* (as needed in Session 2).

Note: Shaded areas indicate the step is not applicable.

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Session 1	Session 2	
		8. Read aloud *Inquiry Task Session Rules* (Appendix 1, page 21) to students.
		9. Read aloud *Written Test Session Rules* (Appendix 2, page 22) to students.
		10. Read aloud "Description" and "Test Resources and Directions" from *Inquiry Task* booklet to students (page 3 in test booklet).
		11. Read aloud "Description" and "Test Resources and Directions" from *Written Test* booklet to students (inside cover in test booklet as well as the directions on page 9).
		12. Remind students to:
		– pace themselves in writing the test;
		– use the *Answer/Scoring Sheet* for responding to multiple choice items; and
		– check over their work to ensure that all questions have been attempted.
		13. **Instruct students to turn the page and begin. Record the start time on the *Supervising Teacher Report.***
(✓)		**During the test session**
		1. Supervise the completion of the *Attendance Form* by ensuring that students print their name beside their test booklet number. Under "Student Attendance During Test Sessions", record a "✓" for present. The names of absent students should be written on the *Attendance Form* so that these students will have a booklet number for the next session of the test. Indicate that the student is absent by recording an "A" on the *Attendance Form* (see sample *Attendance Form*, Appendix 5, page 25). **Note:** This is the only record connecting students' identities to their *Inquiry Task* and *Written Test* booklets.
		2. Ensure that each student absent for the first test session completes a *Demographic Data Form.*
		3. Verify that all the information on each *Demographic Data Form* is accurately printed and shaded. Place all used forms in numerical order followed by any unused forms in the labelled envelope provided. Do not use elastic bands, staples or paper clips on these forms as they may damage the sheets. Do not seal the envelope.
		4. Half-way through the test session, advise students of the amount of time remaining by writing it on the board.
(✓)		**Ending the test session**
		1. Have students place their *Answer/Scoring Sheet* (session 2 only) and/or their individually prepared study sheet inside the front cover of the test booklet.
		2. Collect the test booklet from each student. Extra paper printed out or used by a student must be stapled in the booklet at the appropriate page (or onto the back page if used for miscellaneous calculations).

Session 1	Session 2	
		3. As students submit their test materials, ensure that each test booklet number matches the information on the *Answer/Scoring Sheet*, the *Attendance Form* and the study sheet (e.g., cross-reference student name and test booklet number). Each student must have the same booklet number on all test materials.
		4. Place a check "✓" on the *Attendance Form* in the "Booklets Submitted to LMC for Marking" column.
		5. **Record the time students finish writing the test on the *Supervising Teacher Report*.** Do not include extra time given for late arrivals or adaptations.
		6. Remove the study sheets from the test booklets, sort them numerically by booklet number and place them in the envelope labelled "For the Return of Study Sheets". Do not seal the envelope.
		7. Stack the test booklets in numerical order.
		8. If marking is conducted in the classroom or at the school, leave the *Answer/Scoring Sheets* inside the front cover of each booklet. After marking, place all used *Answer/Scoring Sheets* in numerical order followed by any unused forms. Place the forms in the labelled envelope. Do not seal the envelope. If marking is conducted in a central location, place all used *Answer/Scoring Sheets* in numerical order followed by any unused forms. Place the forms in the labelled envelope. Do not seal the envelope.
		9. Complete the *Supervising Teacher Report*. Note any unusual circumstances on this report.
		10. Record and shade in the appropriate Reason Code on the pre-printed *Demographic Data Form* for all students who were absent for **all** sessions (see Appendix 3, page 23).
		11. Record and shade in the appropriate Drop-in Code on the generic *Demographic Data Form* for those students who were not included at the time of registration but were present to write the test (see Appendix 4, page 24).
		12. Ensure that the number of check marks in the "Booklets Submitted to LMC for Marking" column on the *Attendance Forms* matches your count of the booklets and *Answer/Scoring Sheets* for submission.
		13. Complete the *Student Registration Update Form* if applicable. Use the reason codes (Appendix 6, page 26) provided.
		14. Make two copies of the *Attendance Forms* and *Supervising Teacher Report*. One copy must be retained by the school and one forwarded to the local marking site, if a centralized marking model is used.
		15. Collect the *Principal Feedback Form*.
		16. Complete the *Supervising Teacher Feedback Form*.

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Note: Shaded areas indicate the step is not applicable.

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Session 1	Session 2	
		17. Return all test booklets and other test-related materials to the secure area in the school until commencement of the next session, marking or until materials are to be forwarded to the local marking site.
		18. Send materials according to the instructions on the following pages.

Points to Remember

- Remain in the classroom throughout the entire test session and engage in work solely related to the duties of supervising the test.
- A replacement supervisor must be available to assist you.
- Store all documents not in use in a secure area in the school.
- Ensure that once a booklet number has been assigned to a student, all materials distributed to that student have the same booklet number.
- Students may **not** have access to their test booklets between sessions.
- Students may bring an 8½ × 11 individually prepared study sheet into the test sessions.
- Students may **not** review or complete work from the previous session.
- Students may use the Internet to access tools employed in the everyday Applied Mathematics (40S) class.

Submitting materials

Schools may use a variety of marking models for the Senior 4 Applied Mathematics (40S) Standards Test. The directions for returning test materials are specific to the marking model used.

Centralized marking (scored at a central location)

Before marking

It is essential that the following materials are packaged and forwarded **to the local marking site** immediately after completion of the test on June 10, 2004:

- **All used** test booklets;
- **All used** *Answer/Scoring Sheets*;
- **All** *Recording Sheets* (for recording marks for the Inquiry Task);
- Copy of the *Attendance Forms*; and
- Copy of the *Supervising Teacher Report*.

All other documentation should be verified and returned **to the Assessment and Evaluation Branch** by the supervising teacher after completion of the test on June 10, 2004.

- **All original** *Attendance Forms*;
- **All** *Demographic Data Forms* (in envelope provided);
- **All** individually prepared study sheets (in envelope provided);
- *Student Registration Update Form*;
- *Supervising Teacher Report*;
- *Supervising Teacher Feedback Form*;
- *Principal Feedback Form*; and
- All damaged or misprinted booklets.

Schools in the City of Winnipeg return their envelopes to the Assessment and Evaluation Branch by calling Mid-Canada Courier (989-5630) and arranging pick-up between **1:00 p.m. and 4:00 p.m.** on **June 10, 2004**. The person placing the call should quote **account number E901**, provide the school name, address and the name of the contact person. (See section "Shipping materials to the department", page 17).

Schools outside the City of Winnipeg return their envelopes to the Assessment and Evaluation Branch by using the Xpresspost Flexipack envelope provided and taking it to the post office.

After marking

When local marking is done at a central location, the Local Marking Co-ordinator is responsible for sending the materials to the Assessment and Evaluation Branch.

After local marking is completed, prepare a package to be received by the Assessment and Evaluation Branch no later than June 18, 2004.

The package must include:

- **All** *Answer/Scoring Sheets* and *Recording Sheets*;
- Test booklets (*Inquiry Task* and *Written Test*) requested by the department for feedback on the marking process;
- *Sample Request List*; and
- *Local Marking Co-ordinator Feedback Form.*

School-based and classroom-based marking (scored by classroom teacher)

When local marking is done at the school or classroom level, the school is responsible for sending the materials to the Assessment and Evaluation Branch.

After local marking is completed, prepare a package to be received by the Assessment and Evaluation Branch no later than June 18, 2004.

The package must include:

- **All original** *Attendance Forms*;
- **All** *Demographic Data Forms*;
- *Student Registration Update Form*;
- *Supervising Teacher Report*;
- *Supervising Teacher Feedback Form*;
- *Principal Feedback Form*;
- **All** *Answer/Scoring Sheets* and *Recording Sheets*;
- Test booklets (*Inquiry Task* and *Written Test*) requested by the department for feedback on the marking process;
- *Sample Request List*;
- *Local Marking Co-ordinator Feedback Form*; and
- All damaged or misprinted booklets.

Shipping materials to the department

Jurisdictions within the City of Winnipeg send packages directly to the Assessment and Evaluation Branch via Mid-Canada Courier (989-5630). The person placing the call should quote **account number E901**, give the jurisdiction name, address, and the name of the contact person.

Jurisdictions outside the City of Winnipeg return their package by Xpresspost. It is very important to package all materials in the **Xpresspost Flexipack envelope** provided, whenever possible.

After the package is sealed, deliver it to the local post office.

We have provided sufficient materials for the return of **one** envelope/package. If you must send a second envelope/package, photocopy the mailing address label and affix the copy to the second package. Note you must use a photocopy of the mailing address label as it provides Canada Post with billing information. Ask the postal clerk for an additional bar code label to attach to the second envelope/package. Ensure that the school representative retains the bar code number in case tracing the package is required.

Return **all** *Answer/Scoring Sheets* and *Recording Sheets*. We remind you that payments will be made according to the number of completed marking sheets received.

Appendices

Appendix 1: Inquiry Task Session Rules

Senior 4 Applied Mathematics (40S) Standards Test

The supervising teacher is expected to read these rules aloud to students at the beginning of the Inquiry Task session of the Senior 4 Applied Mathematics (40S) Standards Test:

- Check the title of your test booklet carefully.
- Write your test booklet number in the upper right-hand corner on your study sheet.
- During this test session, do not proceed until instructed to do so.
- If you receive a damaged or misprinted booklet, raise your hand and I will give you a new one.
- You are expected to remain in the test room until **one hour** of test time has elapsed. (You may leave before that time in exceptional circumstances such as illness, when accompanied by a supervisor.)
- At the beginning of the session you should only have the *Inquiry Task* booklet, a *Demographic Data Form*, an HB pencil, an eraser, a ruler, a protractor, your graphing calculator or computer, and your individually prepared 8½ × 11 study sheet. If you need extra paper to show your work, please raise your hand and I will bring it to you. No other materials are permitted. Do not exchange test materials.
- If you choose to print your answers from the computer, ensure your booklet ID number appears on each page. Remain seated and I will distribute the printouts to you.
- You will not give assistance to, nor receive assistance from another student. If you require something during the test, raise your hand and I will come to you.
- During the test I can help you with the directions, but I will not be able to help you with the test questions.
- Do **not** identify yourself, your school, teacher or town in your test booklet.
- When I ask you to stop writing, put your pencil down immediately.
- You may not discard any materials. The test booklet must remain intact unless otherwise instructed. Any extra paper used must be stapled into the test booklet on the appropriate page. You may **not** leave the room with any materials pertaining to the test.

Appendix 2: Written Test Session Rules

Senior 4 Applied Mathematics (40S) Standards Test

The supervising teacher is expected to read these rules aloud to students at the beginning of the Written Test session of the Senior 4 Applied Mathematics (40S) Standards Test:

- Check the title of your test booklet carefully.
- Verify that the booklet number in the upper right-hand corner on your study sheet matches the test booklet number.
- During this test session, do not proceed until instructed to do so.
- If you receive a damaged or misprinted booklet, raise your hand and I will give you a new one.
- You are expected to remain in the test room until **one hour** of test time has elapsed. (You may leave before that time in exceptional circumstances such as illness, when accompanied by a supervisor.)
- At the beginning of the session you should only have the *Written Test* booklet, an *Answer/Scoring Sheet*, an HB pencil, an eraser, a ruler, a protractor, your graphing calculator or computer, and your individually prepared 8½ × 11 study sheet. If you need extra paper to show your work, please raise your hand and I will bring it to you. No other materials are permitted. Do not exchange test materials.
- If you choose to print your answers from the computer, ensure your booklet ID number appears on each page. Remain seated and I will distribute the printouts to you.
- You will not give assistance to, nor receive assistance from another student. If you require something during the test, raise your hand and I will come to you.
- During the test I can help you with the directions, but I will not be able to help you with the test questions.
- Do **not** identify yourself, your school, teacher or town in your test booklet.
- When I ask you to stop writing, put your pencil down immediately.
- You may not discard any materials. The test booklet must remain intact unless otherwise instructed. Any extra paper used must be stapled into the test booklet on the appropriate page. You may **not** leave the room with any materials pertaining to the test.

Appendix 3: Sample Pre-printed Demographic Data Form

NEW!

DEMOGRAPHIC DATA FORM / FORMULAIRE DE DONNÉES DÉMOGRAPHIQUES

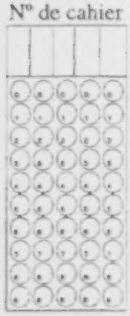
SENIOR 4 APPLIED MATHEMATICS STANDARDS TEST – JUNE 2004 /
TEST BASÉ SUR LES NORMES MATHÉMATIQUES : APPLIQUÉES DE SECONDAIRE 4 – JUIN 2004

School/ École	**9999 SCHOOL NAME**	Program/ Programme	**ENGLISH**
Name/ Nom	**SURNAME, GIVEN NAME**		
Birth Date/ Date de naissance	**01/01/01**	MET #/ N° MET	**999-999-999**

INSTRUCTIONS TO THE STUDENT:

1. Write and shade in the **Booklet No.**
2. Use an HB pencil only. Do not use ink, ball point, or felt tip pens.
3. Erase cleanly any marks you wish to change.
4. Do not mark other areas on this form.
5. If the pre-printed information is inaccurate, please cross it out and write in the correct information.

Booklet No./ N° de cahier



DIRECTIVES À L'ÉLÈVE :

1. Inscrire votre **N° de cahier** et noircir les cercles qui y correspondent.
2. Utiliser seulement un crayon HB. Ne pas utiliser de stylo à encre ou à bille, ni de crayon feutre.
3. Bien effacer toute marque que vous désirez changer.
4. Ne pas faire de marques à d'autres endroits sur ce formulaire.
5. Si les renseignements pré-imprimés sont inexacts, les rayer et écrire les renseignements exacts.

OR/OU

FOR TEACHER USE ONLY:

Write and shade in the **Reason Code** if the student is absent for **all** test sessions. Please see list of reason codes and instructions enclosed.

Reason Code/ Code désigné

Other/Autre :

À L'USAGE DE L'ENSEIGNANT SEULEMENT :

Écrire le **Code désigné** et noircir les cercles qui y correspondent si l'élève est absent pour **toutes** les séances de test. Veuillez vous reporter à la liste de codes et aux directives ci-incluses.

9999

Appendix 4: Sample Generic Demographic Data Form

DEMOGRAPHIC DATA FORM

Manitoba

NAME (Last)

NAME (First)

INSTRUCTIONS

- Use an HB pencil only.
- Do not use ink, ballpoint, or felt tip pens.
- Shade the circle completely.
- Erase cleanly any marks you wish to change.
- Do not mark other areas on this form.

EXAMPLES

INCORRECT

CORRECT

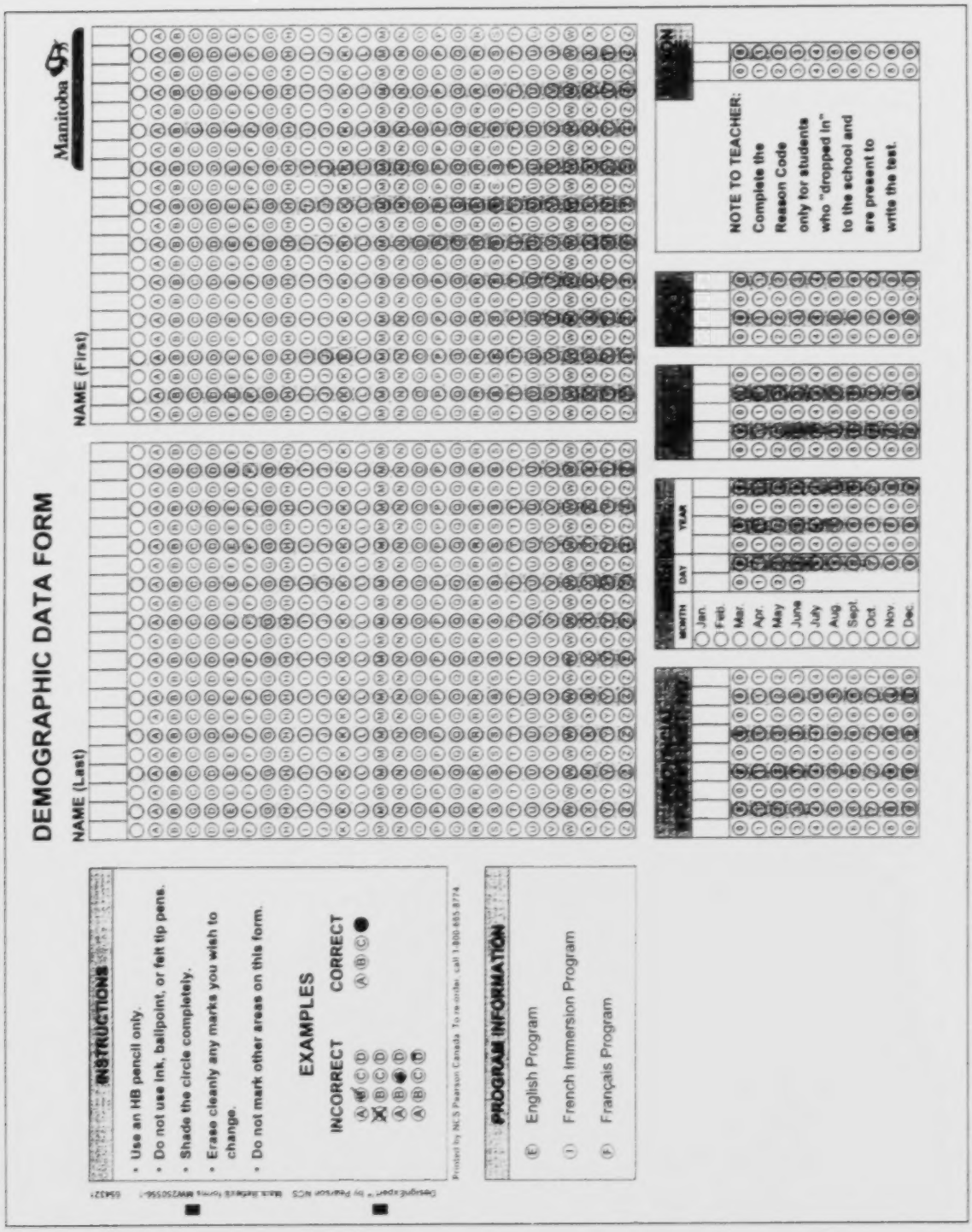
PROGRAM INFORMATION

1. English Program
2. Core Immersion Program
3. French Program

PROVINCIAL STUDENT (MET) NO.	BIRTH DATE			BOOKLET NO.	SCHOOL CODE	REASON CODE
	MONTH	DAY	YEAR			
	Jan					
	Feb					
	Mar					
	Apr					
	May					
	June					
	July					
	Aug					
	Sept					
	Oct					
	Nov					
	Dec					

NOTE TO TEACHER:
Complete the Reason Code only for students who "dropped in" to the school and are present to write the test.

Appendix 4: Sample Generic Demographic Data Form



DEMOGRAPHIC DATA FORM

Manitoba

NAME (Last)

NAME (First)

INSTRUCTIONS

- Use an HB pencil only.
- Do not use ink, ballpoint, or felt tip pens.
- Shade the circle completely.
- Erase cleanly any marks you wish to change.
- Do not mark other areas on this form.

EXAMPLES

INCORRECT	CORRECT
Ⓐ ⓑ Ⓒ Ⓓ	Ⓐ Ⓑ Ⓒ ●
Ⓐ Ⓑ Ⓒ Ⓓ	
Ⓐ Ⓑ ● Ⓓ	
Ⓐ Ⓑ Ⓒ Ⓓ	

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"Designexpert" by Pearson NCS. Mark Sense Forms MWZ50556-1 05M27

PROGRAM INFORMATION

Ⓔ English Program

Ⓘ French Immersion Program

Ⓕ Français Program

MONTH: Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.

DAY

YEAR

NOTE TO TEACHER: Complete the Reason Code only for students who "dropped in" to the school and are present to write the test.

Appendix 5: Sample Attendance Form

School Number: 9999
Somewhere School
Somewhere Address
Somewhere MB R0R 0R0

Page _____ of _____

ATTENDANCE FORM—JUNE 2004

SENIOR 4 APPLIED MATHEMATICS (40S) STANDARDS TEST

Booklet Number	Student Name (*please print*)	Student Attendance During Test Sessions		Inquiry Task Booklets Submitted to LMC* for Marking (*check* ✓)	Written Test Booklets Submitted to LMC* for Marking (*check* ✓)
		Inquiry Task	Written Test		
10001	Sandra Wong	✓	✓	✓	✓
10002	Kevin Melnychuk	✓	A	✓	
10003	DAMAGED				
10004	Dallas Severn (also 10008)	✓	✓	✓	✓
10005	Manuel Sousa	✓	✓	✓	✓
10006	Robert Smith	A	A		
10007	Julie Curtis	A	✓		✓
10008	Used with 10005 (damaged)				
10009	UNUSED				
10010	UNUSED				

Note: Record a "✓" for Present. An "A" indicates a student is Absent.

Mr. Jim Mederski
Supervising Teacher's Name (*please print*)

Please retain a copy of this form for your records. You will need a copy of this form to link your locally marked test with a student's name.

***Local marking co-ordinator**

Appendix 6: List of Reason Codes to Record Changes in Standards Test Student Registration Numbers

(Please use these codes to complete the *Student Registration Update Form* and the *Demographic Data Form* before returning them to the Assessment and Evaluation Branch in June 2004.)

ABSENT	
01	arrived too late to write the test
02	did not write due to weather
03	family/personal reasons
04	medical/illness/accident
05	out-of-town activity (athletic/academic)
06	religious objections
07	student refused to write
08	unexcused
09	working
10	suspended
19	other (please specify)

WITHDRAWN	
22	dropped course
23	incarcerated/court
24	medical/illness/accident
25	family/personal reasons
26	poor attendance/progress
27	quit school
28	expelled
29	other (please specify)

ERRORS IN REGISTRATION	
20	changed program
21	deceased
50	already has credit
51	auditing the course
52	exchange student
53	registered twice
54	quarter system projected registration
55	registered in wrong grade/course
59	other (please specify)

INCOMPLETE	
40	continuing course/program next semester
41	no work completed
49	other (please specify)

EXEMPTIONS	
60	emotional/psychological condition or circumstances
61	"M" credit designation
62	"E" credit designation
63	"phase d'accueil—bloc intensif" designation
69	other (please specify)

DROP INS	
70	forgotten on original test registration
71	late registration to course
72	transferred in from another school/province/country
73	re-write (not currently enrolled)
79	other (please specify)

MIGRANCY	
90	transferred to another school within the province
91	transferred to another school outside of the province
99	other (please specify)

Senior 4 Applied Mathematics (40S) Standards Test

Written Test

June 2004

Manitoba

Building for the Future

SENIOR 4 APPLIED MATHEMATICS (40S)
STANDARDS TEST

DESCRIPTION

Total Possible Marks: 59 **Time: 2.5 hours**

This test consists of two sections:

	Description	Suggested Time to Complete	Marks
Section A	10 multiple-choice questions worth 1 mark each	20 minutes	10
Section B	13 constructed-response questions worth between 2 and 6 marks each	130 minutes	49

Test Resources and Directions

- Students are provided with the Standard Normal Distribution table and a formula sheet.
- You may consult your 8 ½ x 11 individually prepared study sheet during the test.
- Use of a graphing calculator, computer software or Website is allowed.
- Use of protractor and ruler are allowed.
- Read all instructions on the test carefully.
- In Section A, choose the best response and mark it on the back of the *Answer/Scoring Sheet.* Do not fold the *Answer/Scoring Sheet* or the test booklet.
- **If you need more space to answer a question, extra pages may be provided by your teacher. Write your booklet ID number and question number on any extra page(s) used and staple it into the booklet where your answer begins. Indicate in the response space of the question that the answer is on a separate sheet.**

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Manitoba Education, Citizenship and Youth,
Assessment and Evaluation Branch,
Winnipeg, Manitoba R3E 3J5

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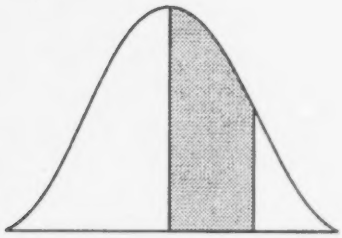
z-Score Chart



Notes:

1. For values of *z* above 3.09, use 0.4999 for the area.
2. Use these common values that result from interpolation:

z-score	area
1.645	0.4500
2.575	0.4950

The Standard Normal (*z*) Distribution

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

Formula Sheet

Vectors

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\sin x = \frac{o}{h} \qquad \cos x = \frac{a}{h} \qquad \tan x = \frac{o}{a}$$

$$a^2 + b^2 = c^2$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$b^2 = a^2 + c^2 - 2ac \cos B$$

$$c^2 = a^2 + b^2 - 2ab \cos C$$

Personal Finance

$$I = PRT$$

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

$$A = P(1+i)^n$$

$$\text{mill rate} = \frac{\text{total taxes to be raised}}{\text{total assessed value}} \times 1000$$

Probability

$$P(A') = 1 - P(A)$$

$$P(\text{success}) = \frac{\text{number of successes}}{\text{number of outcomes}}$$

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$P(A \text{ and } B) = P(A) \times P(B)$$

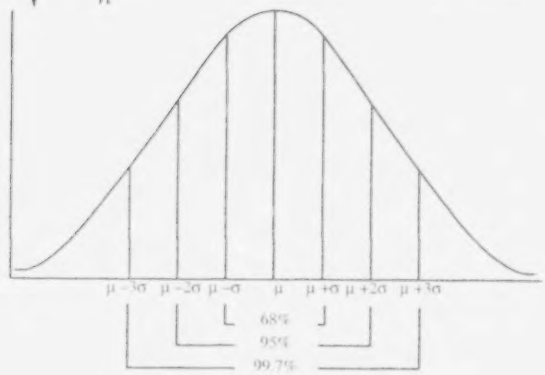
$${}_nP_r = \frac{n!}{(n-r)!}$$

$${}_nC_r = \frac{n!}{r!(n-r)!}$$

Variability and Statistics

$$z = \frac{x - \bar{x}}{\sigma} \qquad \bar{x} = \frac{\sum x}{n} \text{ or } \bar{x} = np$$

$$\sigma = \sqrt{\frac{\sum (x-\mu)^2}{n}} \qquad \sigma = \sqrt{npq} \qquad \mu = np$$



Design and Measurement

Rectangle: Area $= \ell \times w$

Circle: Area $= \pi r^2$ Circumference $= 2\pi r$

Triangle: Area $= \frac{bh}{2}$

or $\sqrt{s(s-a)(s-b)(s-c)}$, where $s = \frac{a+b+c}{2}$

Trapezoid: Area $= \left(\frac{b_1 + b_2}{2}\right)h$

Prism: Surface area $= Ph + 2B$

Volume $= B \times h$

Pyramid: Volume $= \frac{B \times h}{3}$

Sphere: Volume $= \frac{4}{3}\pi r^3$ Surface area $= 4\pi r^2$

Cylinder: Volume $= \pi r^2 h$ Surface area $= 2\pi rh + 2\pi r^2$

Periodic Functions

$$\text{Period} = \frac{2\pi}{\text{Frequency}} \text{ or } \frac{2\pi}{b}$$

$$y = a\sin(bx + c) + d$$

$$y = a\cos(bx + c) + d$$

SECTION A: MULTIPLE-CHOICE

Value: 10 marks **Suggested Time: 20 minutes**

1. Last week a store sold 26 car batteries and 9 car warmers. This week it sold 15 batteries and 11 car warmers. The profit on a battery is \$22.17 and the profit on a car warmer is \$25.00.

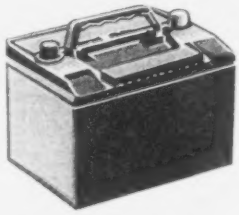
   Which of the following matrix operations could be used to calculate the profit earned by the store from batteries and from car warmers for the last two weeks?

   A) $\begin{bmatrix} 26 & 9 \\ 15 & 11 \end{bmatrix} * \begin{bmatrix} 25.00 \\ 22.17 \end{bmatrix}$

   B) $\begin{bmatrix} 25.00 & 22.17 \end{bmatrix} * \begin{bmatrix} 26 & 15 \\ 9 & 11 \end{bmatrix}$

   C) $\begin{bmatrix} 26 & 9 \\ 15 & 11 \end{bmatrix} * \begin{bmatrix} 22.17 \\ 25.00 \end{bmatrix}$

   D) $\begin{bmatrix} 26 & 15 \\ 9 & 11 \end{bmatrix} * \begin{bmatrix} 22.17 & 25.00 \end{bmatrix}$



2. If matrix A represents direct routes among airports E, F, G, and H, how many ways can you fly from E to F with no more than one stopover?

$$A = \begin{array}{c} \\ E \\ F \\ G \\ H \end{array} \begin{array}{c} \begin{array}{cccc} E & F & G & H \end{array} \\ \begin{bmatrix} 0 & 2 & 1 & 2 \\ 1 & 0 & 1 & 1 \\ 0 & 2 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{bmatrix} \end{array}$$

   A) 0

   B) 2

   C) 4

   D) 6

3. Which vector most closely represents 5 km, with a bearing of 100°?

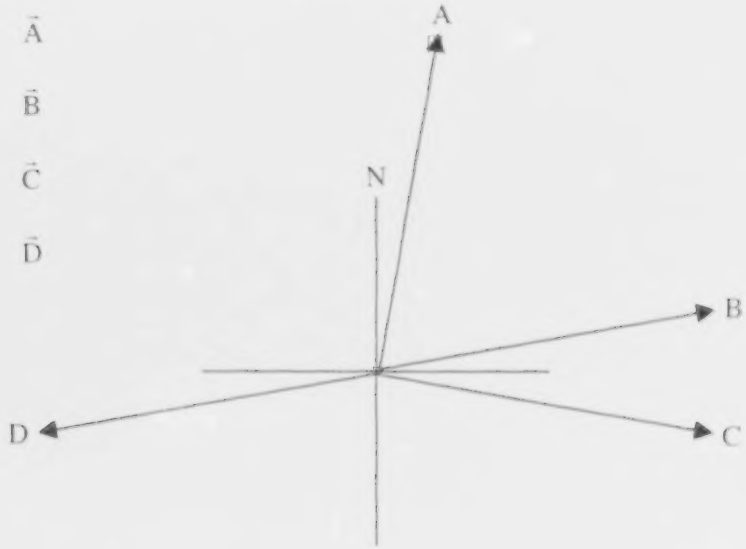
1 cm = 1 km

A) $\vec{A}$

B) $\vec{B}$

C) $\vec{C}$

D) $\vec{D}$



4. Every street in Canada is assigned a postal code made up of 3 letters and 3 numbers that alternate.

How many different postal codes can be created if the first letter must be a P and the first number must be a 4?

A) 43 200

B) 67 600

C) 11 232 000

D) 17 576 000

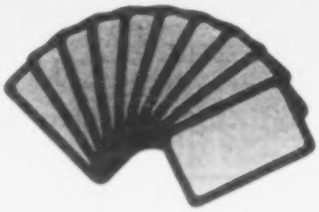
5. There are 10 cards numbered 1 to 10 laying face down on the table. If you select 2 cards at the same time, what is the probability that both cards selected are even numbers?

A) $\frac{1}{5}$

B) $\frac{2}{9}$

C) $\frac{1}{4}$

D) $\frac{9}{10}$



6. A distributor of light bulbs has found that 3.2% of the light bulbs are defective. Find the standard deviation of the defective bulbs in a batch of 400.

A) 3.52

B) 3.58

C) 12.39

D) 12.80

7. A population of five students write a test with the following results:

70 80 85 60 75

The standard deviation of the scores for these students is:

A) 5.0

B) 8.6

C) 9.6

D) 74

8. Which of the following would **NOT** be considered a periodic event?

A) the number of cars in a parking lot vs. time during a given day

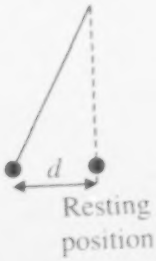
B) the average temperature at the equator vs. months of the year

C) the relative height of a stretched-spring mass vs. time in seconds, in a science experiment

D) the score on a provincial standards test vs. the number of hours studied

9. A grandfather clock has a pendulum that swings in each direction from its resting position. The position of the pendulum was measured and the following data was collected.

Time t (seconds)	0	0.3	0.7	1.4	1.6	1.9	2.5	3
Distance d (cm)	0	5.88	9.95	2.08	−2.08	−7.43	−8.66	0



Which of the following best represents the amplitude of this sinusoidal data?

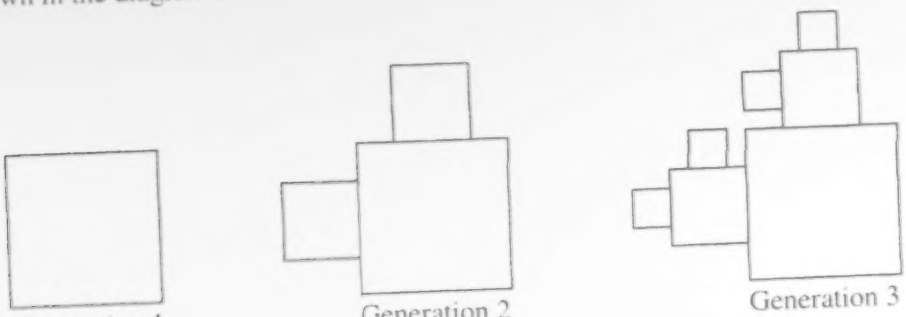
A) −10

B) 0

C) 10

D) 20

10. A fractal is formed as follows: New squares, with sides half the length of the original side(s), are drawn on the centre of the top and left sides only of the original square(s), as shown in the diagram.



Generation 1 Generation 2 Generation 3

The number of new squares created in the 6th Generation would be:

A) 8

B) 16

C) 32

D) 64

BLANK PAGE

SECTION B: CONSTRUCTED-RESPONSE

(Value: 49 marks) **(Suggested Time: 130 minutes)**

DIRECTIONS

- There are 13 constructed-response questions in this section of the test. Each question is worth between 2 and 6 marks.

- Provide **complete answers** in the spaces provided in the test booklet. You may print out sketches from the computer or your calculator where applicable. Make sure these printouts contain your booklet ID number. Remain seated and your teacher will distribute these printouts to you. Staple the printouts in the booklet where the question begins. Indicate in the response space of the question that the answer is on a printed sheet.

- Provide clear explanations or justifications where applicable. This could be done through labelled diagrams, in words, by showing mathematical operations to verify your answer, or by referencing a software or a calculator program.
    - If you reference a calculator program indicate your input values.
    - If you reference a spreadsheet, print a copy of the formulas and a copy of the answers.
    - If you reference a Web site, indicate your input values and print or copy the screen showing answers.

- Let the mark values for each question guide your time and the amount of detail you use in your answer. Mark values for subsections of a question are indicated in parentheses.

- Round your final answers to the nearest two decimal places.

- Unless otherwise specified, it is not necessary to draw sketches to scale. If you draw a scale diagram, make sure you indicate your scale.

- An answer without any work shown will be considered incomplete.

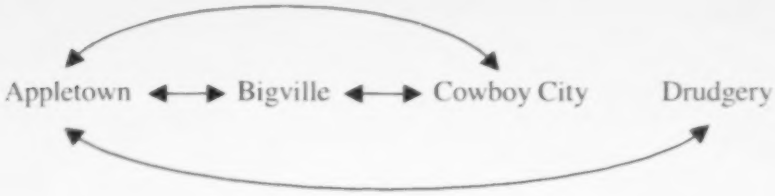
- Always state your assumptions.

DO NOT USE

101

11. The following diagram represents network connections among four communities.

Total: 4 marks



a) Create a direct route matrix that shows the number of connections among communities.

(1 mark)

b) Show matrix operations representing the number of connections through at most one other town.

(1 mark)

c) Which town is the least accessible through exactly one other town? Support your answer.

(2 marks)

DO NOT USE

102

12. In the Manitoba Fantasy Baseball league, players on protected lists are often traded.

Total: 3 marks

Each season:

- The Baldur Bruins release 3% of their players to the Selkirk Stingrays.
- The Stingrays send 2% of their players back to the Bruins.

The Bruins start with 78 players and the Stingrays begin with 62 players.

Create a transition matrix which describes player movement and use it to calculate the number of players on each team after one season.

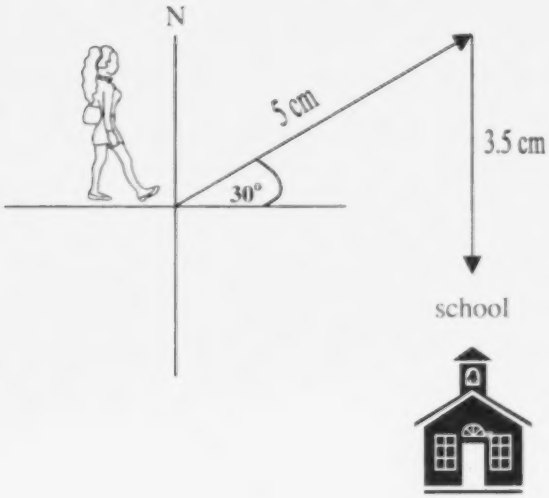
DO NOT USE

103

13. To walk to school, Angie follows the path shown by the vector diagram below.

Total: 3 marks

1 cm = 0.5 km



a) Calculate the resultant vector.

(2 marks)

b) What does the resultant vector represent in this situation?

(1 mark)

DO NOT USE

104

14. Fred is currently participating in an Adventure Race, and is using a compass to navigate in the wilderness. He is at station A. Station B is located 14 km away in the direction E 24° S from his current position. Station C is located 5 km from station B at E 29° N.

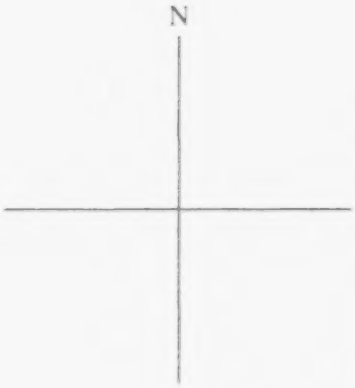
Total: 6 marks

a) What is Fred's most direct route to station C? Include distance and direction. Show your work.

(3 marks)

b) The competitors have been alerted that grizzly bears have been seen midway along the routes. Draw an alternate route from station A to station C, where Fred must start travelling NE to avoid the grizzly bears. Give all distances and directions.

(3 marks)

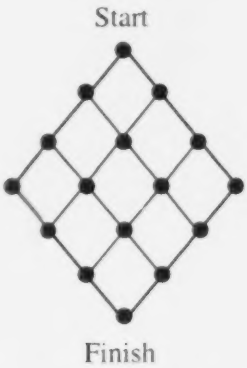


DO NOT USE

105

15. A maze through a corn field is created in the shape of a diamond. A person can move from point to point along the pathways throughout the maze in a direction heading toward the finish.

Total: 3 marks



a) Determine the total number of pathways possible from start to finish. Support your answer.

(2 marks)

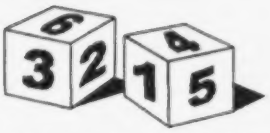
b) If a person was restricted to exactly two turns in the maze, how many pathways would be possible from start to finish?

(1 mark)

DO NOT USE

106

16. You toss two cubes, each numbered 1 to 6.



Total: 4 marks

a) What is the probability of getting two odd numbers that are both less than 4? Show your work.

(2 marks)

b) Using the number cubes, give an example of two events, M and N, that are not mutually exclusive. Calculate the probability P(M or N).

(2 marks)

DO NOT USE

107

17. As part of an annual plan, a research firm surveyed several communities and gathered the following data. The table shows the number of children from 98 families selected at random.

Total: 4 marks

Number of children	Number of families
0	6
1	13
2	20
3	24
4	19
5	11
6	5

a) Calculate the population standard deviation for the number of children in each family.

(1 mark)

b) Explain how the data in this situation compares to a normal distribution. Justify your answer.

(2 marks)

c) In another province, a similar survey was found to be normally distributed with a mean of 2.92 and a standard deviation of 1.61. Use normal distributions to compare the number of children in each family in the two surveys.

(1 mark)

DO NOT USE

108

Total: 4 marks

18. A department store's shoe sales are famous. Based on the sales for the ten previous years they expect that 89% of their shoes on sale will be sold. The department store will have 400 pairs of running shoes on sale this weekend.

a) Calculate the number of pairs of shoes they expect to sell (mean) this weekend and the standard deviation based on this information.

(2 marks)

b) Find the 95% confidence interval for the number of pairs of shoes that will be sold this weekend.

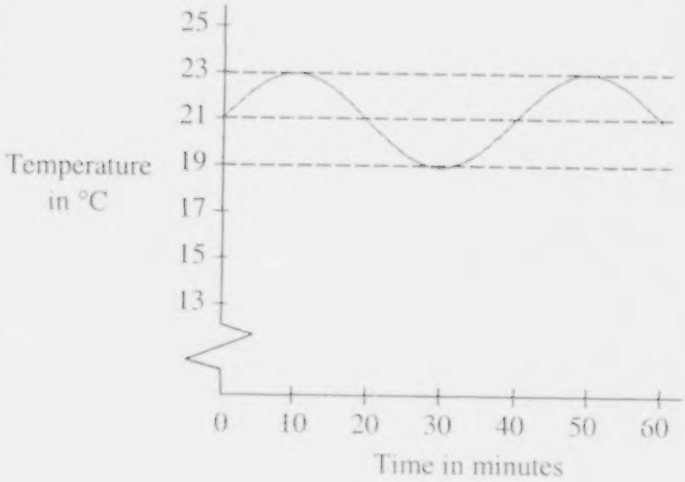
(1 mark)

c) Would the 99% confidence interval for this data be smaller, the same, or larger than the 95% confidence interval? Explain why.

(1 mark)

19. A thermostat keeps the temperature in a room between 19° and 23°C, as shown in the graph.

Total: 6 marks



a) Write an equation for this sinusoidal function.

(2 marks)

b) An imported tropical bird becomes agitated when the temperature drops below 20° C. For how long during the first hour will the bird be agitated in this room? Show how you arrived at your answer.

(2 marks)

c) Identify the period of the equation. What factor might cause the period to change?

(2 marks)

DO N
USE

10

DO NOT USE

110

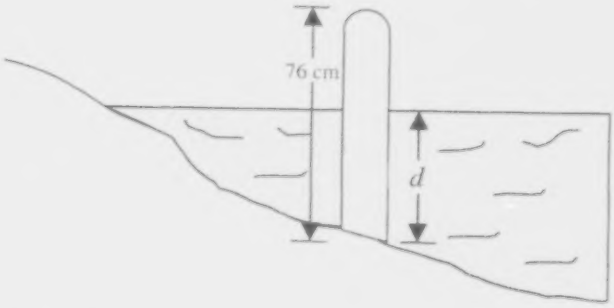
Total: 3 marks

20. At a certain point on the beach, a post sticks out of the sand, its top being 76 cm above the beach (as shown in the sketch). The depth (d) of the water at the post varies sinusoidally with time due to the motion of the tides.

The function that fits this situation is

$$d = 30\sin(0.524t - 1.05) + 38$$

where d is depth and t is the number of hours after midnight.



a) Sketch the graph of the function on the grid below. Complete a 24 hour span and clearly label your graph indicating the maximum and minimum.

(2 marks)

b) What is the difference between the water level at high tide and the top of the post?

(1 mark)

21. Currently a city has 986 occupied apartment suites. Every year, 12% of the renters move out of their apartments, while 122 new renters sign leases.

Total: 4 marks

DO NOT USE

111

a) How many apartments will be occupied after 5 years? Support your answer.

(2 marks)

b) If these trends continue, how many apartments will be needed when stabilisation occurs? Use sequences to justify your answer.

(2 marks)

DO NOT USE

112

22. The following instructions create a fractal pattern. Answer the questions in the space below.

Total: 3 marks

generation 1 — Sketch a square.

generation 2 — Sketch another square, ¼ the area of the previous square, such that it is attached to the previous square on the right side, and level with the top.

a) Sketch the 4th generation of the fractal.

(1 mark)

b) Given that the area of the new square in the 6th generation of the fractal is 0.25 units^2 find the length of each side of the new square in the 2nd generation. Support your answer.

(2 marks)

23. A wedding cake has square layers that are 3 inches tall. Each layer's side length is half as long as the length of the layer below it.

Total: 2 marks

If each side of the base layer is 12 inches long, use sequences to calculate the volume of a cake with 4 layers.

DO NOT USE

113

END OF TEST

NO MARKS WILL BE AWARDED FOR WORK DONE ON THIS PAGE

NO MARKS WILL BE AWARDED FOR WORK DONE ON THIS PAGE

Senior 4 Applied Mathematics (40S) Standards Test

Inquiry Task

June 2004

Manitoba

Building for the Future

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Manitoba Education, Citizenship and Youth,
Assessment and Evaluation Branch,
Winnipeg, Manitoba R3E 3J5

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Formula Sheet

Vectors

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\sin x = \frac{o}{h} \qquad \cos x = \frac{a}{h} \qquad \tan x = \frac{o}{a}$$

$$a^2 + b^2 = c^2$$

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$b^2 = a^2 + c^2 - 2ac\cos B$$

$$c^2 = a^2 + b^2 - 2ab\cos C$$

Personal Finance

$$I = PRT$$

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

$$A = P(1+i)^n$$

$$\text{mill rate} = \frac{\text{total taxes to be raised}}{\text{total assessed value}} \times 1000$$

Probability

$$P(A') = 1 - P(A)$$

$$P(\text{success}) = \frac{\text{number of successes}}{\text{number of outcomes}}$$

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$P(A \text{ and } B) = P(A) \times P(B)$$

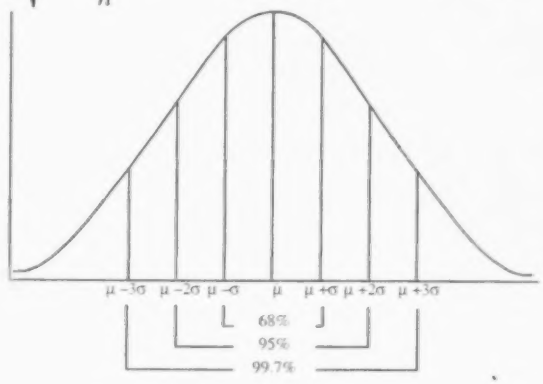
$${}_nP_r = \frac{n!}{(n-r)!}$$

$${}_nC_r = \frac{n!}{r!(n-r)!}$$

Variability and Statistics

$$z = \frac{x - \bar{x}}{\sigma} \qquad \bar{x} = \frac{\sum x}{n} \text{ or } \bar{x} = np$$

$$\sigma = \sqrt{\frac{\sum (x-\mu)^2}{n}} \qquad \sigma = \sqrt{npq} \qquad \mu = np$$



Design and Measurement

Rectangle: Area $= \ell \times w$

Circle: Area $= \pi r^2$ Circumference $= 2\pi r$

Triangle: Area $= \frac{bh}{2}$

or $\sqrt{s(s-a)(s-b)(s-c)}$, where $s = \frac{a+b+c}{2}$

Trapezoid: Area $= \left(\frac{b_1 + b_2}{2}\right)h$

Prism: Surface area $= Ph + 2B$

Volume $= B \times h$

Pyramid: Volume $= \frac{B \times h}{3}$

Sphere: Volume $= \frac{4}{3}\pi r^3$ Surface area $= 4\pi r^2$

Cylinder: Volume $= \pi r^2 h$ Surface area $= 2\pi rh + 2\pi r^2$

Periodic Functions

$$\text{Period} = \frac{2\pi}{\text{Frequency}} \text{ or } \frac{2\pi}{b}$$

$$y = a\sin(bx + c) + d$$

$$y = a\cos(bx + c) + d$$

SENIOR 4 APPLIED MATHEMATICS (40S)
STANDARDS TEST

DESCRIPTION

Total Possible Marks: 19

Time: 2 hours

This test consists of two tasks:

	Description	Suggested Time to Complete	Marks
Task 1	Contains questions on Personal Finance worth 9 marks	60 minutes	9
Task 2	Contains questions on Design and Measurement worth 10 marks	60 minutes	10

Test Resources and Directions

- This test should be written with the assistance of computer software and/or a graphing calculator.
- You may consult your 8 ½ x 11 individually prepared study sheet during the test.
- You are provided with a formula sheet.
- If you use a graphing calculator, make sure you indicate all the values you entered in the space provided in this booklet.
- If you use a spreadsheet, make sure you print two copies of your spreadsheets, one showing the answers and one showing the formulas. Indicate your booklet ID number on each printout. Remain seated and your teacher will distribute these printouts to you.
- If you reference a Web site, indicate your input values and print or copy the screen showing answers.
- Please staple printed copies of all your work on the page of the question. Indicate your booklet ID number on each page. Indicate in the response space of the question that the answer is on a printed sheet.
- Clearly identify the question number on your answer sheet(s) (e.g., Question 2b).
- Always state your assumptions.

PERSONAL FINANCE

DO NOT USE

1. You have recently learned that you will inherit a sum of money. Your lawyer has contacted you to inform you of two payment options. You would like to invest the money, but you want to buy a car that costs $20 000.00 (taxes included). You consider the two options:

Total: 9 marks

114

Option 1: Receive $390 000.00 in one lump sum.

- Pay cash for your car.
- Invest the remaining $370 000.00 at an interest rate of 4% per year compounded monthly.

Option 2: Receive $4 000.00 a month for the next ten years.

- Finance your car for 5 years at an interest rate of 5% per year compounded monthly.
- Invest the remaining monthly allowance at an interest rate of 3.8% compounded monthly.

The car does not have a significant monetary value after ten years of use.

(1 mark) **One mark will be awarded for clearly showing your work or strategy and all calculated results.**

a) In Option 1, what will be the final value of the investment after ten years?

(1 mark)

b) Determine the amount of the monthly car payment in Option 2.

(1 mark)

c) What is the value of the Option 2 investment after the first 5 years?

(2 marks)

DO NOT USE

d) What is the value of the Option 2 investment after the next 5 years?

(2 marks)

e) Recommend an option and state 2 reasons for your choice.

(2 marks)

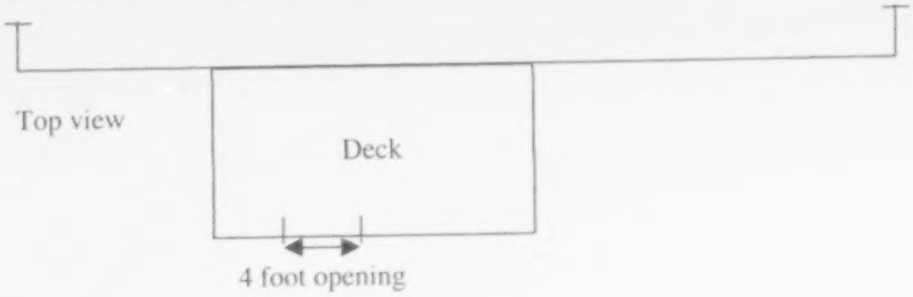
DESIGN AND MEASUREMENT

DO NOT USE

115

Total: 10 marks

2. A deck attached to the back of a house is to be repaired by replacing the floor of the deck and by putting up new railings. The existing frame will be reused, and the new floor will be built on top.



(1 mark) **GST and PST must be added to all costs.**

a) The floor of the deck is 16 feet by 8 feet. Sheets of plywood are to be used to form the floor of the deck. Each sheet of plywood measures 4 feet by 8 feet and costs $21.95. Determine the cost to replace the plywood.

(1 mark)

b) There are two options for protecting the floor from weather conditions.

(3 marks)

Option A: Treat the floor with a waterproof stain. One gallon will cover 45 square feet and the floor will require 2 coats. Each gallon costs $34.95.

Option B: Cover the floor portion of the deck with an outdoor carpeting that costs $1.69 per square foot.

Calculate the cost for each option.

c) Which option would you choose? Explain your choice.

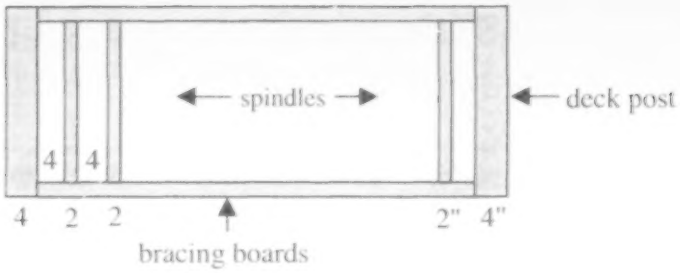
(1 mark)

d) The sections of deck railing are built as shown below:

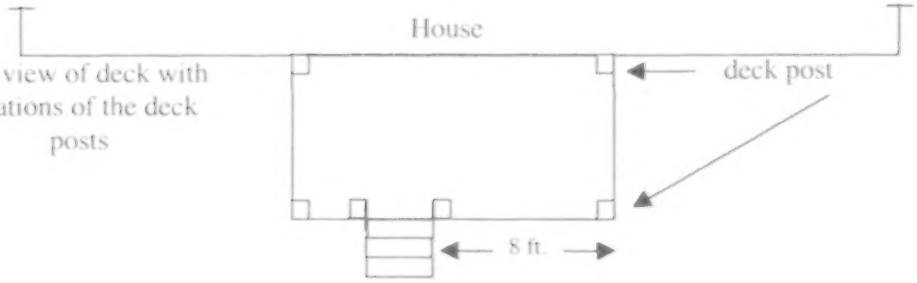
(4 marks)

DO NOT USE

Side view



Top view of deck with locations of the deck posts



- The deck posts are to be set at each corner of the deck and on each side of the opening of the deck. Each deck post is 4" wide.
- Each spindle is 2" wide and they are to be spaced 4 inches apart.
- The bracing boards are attached as shown above. They are sold only in 8 foot lengths.

The costs for the materials are:

- Deck posts are $4.59 each
- Bracing boards are $12.49 per 8 foot length
- Spindles are $1.55 each

Determine the total cost of the materials needed to build the deck railing around the deck.

END OF TEST

NO MARKS WILL BE AWARDED FOR WORK DONE ON THIS PAGE

NO MARKS WILL BE AWARDED
FOR WORK DONE ON THIS PAGE

NO MARKS WILL BE AWARDED FOR WORK DONE ON THIS PAGE

Senior 4 Applied Mathematics (40S) Standards Test

Marking Guide

June 2004

Manitoba

Building for the Future

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Manitoba Education, Citizenship and Youth,
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Table of Contents

General Instructions 1

Answer Key for Multiple-choice items 5
Marking Keys and Scoring Rubrics for Constructed-response items 7
Marking Keys and Scoring Rubrics for the Inquiry Task 59

Appendices
A-Table of Specific Outcome Match and Item Type 86
B-Generating Student Profiles Sheet 87
C-Sheets for marking the Inquiry Tasks 88-89

General Instructions

Organization of document:

Following the general instructions for marking, the document is divided into three sections:

- Answer key for multiple-choice items
- Marking keys and scoring rubrics for constructed-response items
- Marking keys and scoring rubrics for the Inquiry Task

The first section presents the answers for the multiple-choice items in a table accompanied by the learning outcome(s) associated with each item. In the second section, each test item is presented in bold characters, followed by a series of typical and possible answers. A marking key or scoring rubric details how the marks are to be allocated for each sub-section of the question. Marking keys are used to mark restricted-response items (with or without explanations). Scoring rubrics are to be used for scoring open-response items.

For each question, the item type, the maximum number of marks possible as well as the specific outcomes targeted by the item are identified at the top of the page. Items are presented in the order that they appear on the standards test. Each open-response item as well as each Inquiry Task item is followed by a series of student exemplars. Student exemplars are chosen to exemplify the use of scoring rubrics or marking keys. The mark value allocated and a rationale justifying the mark allocation accompany each student exemplar.

General Marking Instructions

Please make no marks in the test booklets.

Please ensure that:

- each student's final result is recorded, by test booklet number, on the corresponding ***Answer/Scoring Sheet*** (computer scan sheet);
- the totals are written at the bottom;
- the *Answer/Scoring Sheet* is complete and correct;
- a copy has been made for school records; and
- **only a pencil is used to complete the *Answer/Scoring Sheets*, by both students and markers.**

Once marking is completed, please forward the *Answer/Scoring Sheets* to Manitoba Education, Citizenship and Youth (for more information see the *Administration Manual for Supervising Teachers*).

Scoring the Multiple-choice items

Please follow the answer key provided on page 5 of this document.

Types of student errors

As a guiding principle, students should only be penalized once for each error committed in the context of a test item. For example, students may choose an inappropriate but still relevant strategy for an item but carry it through correctly and arrive at an incorrect answer. In such cases, students should be penalized for having selected an inappropriate strategy for the task at hand but should be given credit for having arrived at an answer consistent with their choice of strategy.

Please note that for all questions in the vectors unit, allow a flexibility of ±3 mm and ±3° when marking students' scale diagrams.

Throughout this document, four types of errors have been identified. These are defined briefly below:

Trivial errors:
These are errors for which no marks are to be deducted. In order to be considered trivial, an error must be conceptually unrelated to the learning outcome(s) associated with the item and not lead to a mathematically incorrect answer. Examples include omitting labels, omitting to carry a negative sign in an algebraic task or not rounding final answers.

Technical communication errors:
These are errors of mathematical notation that are conceptually related to the curriculum outcomes. It is important to note, however, that such errors do not prevent students from arriving at a mathematically correct answer.
Examples include:

- incorrect use of brackets on matrices;
- not expressing transition matrices as decimals or percentages;
- missing more than one vector head in a response;
- not stating a scale when using a scale diagram as a strategy; and
- not buying in whole units in the design and measurement unit.

In such cases, students are to be penalized no more than a half mark per question for each type of error, and only when the corresponding criteria are awarded.

Minor errors:
These are errors that are generally not conceptual in nature but will inevitably lead to an incorrect answer. In such cases, students are generally penalized one mark depending on the details provided in the marking key or scoring rubric.

Major errors:
These are errors or omissions that are conceptual in nature and clearly reflect a gap in the student's knowledge of the specific learning outcome(s). These types of errors often limit the number of marks that can be awarded to a student's response.

Scoring the Constructed-response items

The respective marking key or scoring rubric should be used in conjunction with the ***Senior 4 Mathematics: Manitoba Curriculum Framework of Outcomes and Senior 4 Standards*** (Applied section) when assigning scores to student responses.

Scoring Guidelines—Restricted-response items (with or without explanation)

Each item of this type is designed to elicit a well-defined response according to the associated specific outcome(s) and relevant mathematical processes. Their purpose is to determine whether a student meets the standards for the course (level 2) as they relate to the knowledge and skills associated with the item.

To receive full marks, a student's response must be complete and correct. Partial marks may be awarded for a "relevant strategy" with execution errors. **A relevant strategy is defined as one that is consistent with the specific outcome(s) and mathematical processes associated with the item that, if properly executed, would lead to the correct answer.** Where alternative strategies are possible, the marking key makes mention of them.

It is important to note that some items require some form of explanation or justification from students. Such explanations and justifications can take various forms depending on students' learning styles. Therefore, marking of student responses needs to reflect appropriate flexibility in this regard. Test instructions to students have clearly specified that explanations or justifications can be done through labelled diagrams, in words, by showing mathematical operations for answer verification or by referencing software, a calculator program, or a Web site.

Scoring Guidelines—Open-response items

These items are designed to elicit student responses at any of the three levels of achievement defined in the *Senior 4 Mathematics: Manitoba Curriculum Framework of Outcomes and Senior 4 Standards* (Applied section). The rubrics contain the language of the curricular standards in order to facilitate scoring in a manner that is consistent with those standards. The recommended procedure for scoring student responses is as follows:

1. Read the relevant specific outcome(s) in the *Senior 4 Mathematics: Manitoba Curriculum Framework of Outcomes and Senior 4 Standards* (Applied section).
2. Read the possible solution(s) provided in this document.
3. Study the student exemplars provided and the rationales for the assigned scores.

4. Carefully view all of the student's response and decide which of the three levels of achievement ("exceptional understanding", "good understanding" or "limited understanding") best applies. Whether the response clearly fits into one category or straddles two, this process will narrow down the number of possible scores that can be assigned to the response.
5. Compare the features of the student's response with the general performance indicators accompanying the mark values and the specific performance indicators (criteria) contained in the rubric. Note that the specific performance indicators only typify a student's response in a given score category. An exact match is not anticipated.

Assistance

If, during marking, any issue arises that cannot be resolved locally, please call Manitoba Education, Citizenship and Youth at the earliest opportunity to advise and/or seek assistance. If required, we will connect you to an advisor. Also, please be sure to notify us before making any modifications to the answer/marking keys or scoring rubrics.

Contact person: Philippe Le Dorze at 945-0670 (1 800 282-8069, extension 0670)

Answer Key
for Multiple-choice items

Question No.	Answer	Outcome
1	C	A1
2	D	A2
3	C	B1
4	B	D2
5	B	D5
6	A	E1, E3
7	B	E1
8	D	G1
9	C	G3
10	C	H2, H3

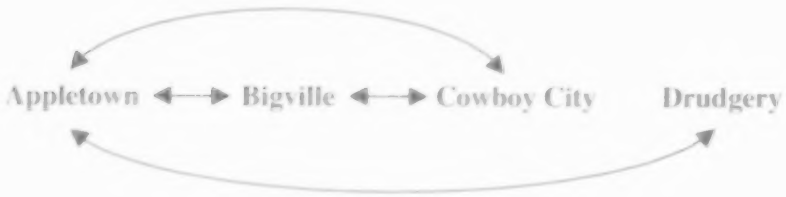
Marking Keys and Scoring Rubrics for Constructed-response items

Specific Outcomes: A2	Item Type: Restricted Response with Explanation

Question No. 11 and Answer

11. The following diagram represents network connections among four communities.

Total: 4 marks



a) Create a direct route matrix that shows the number of connections among communities.

(1 mark)

$$A = \begin{array}{c} \\ A \\ B \\ C \\ D \end{array} \begin{array}{c} \begin{array}{cccc} A & B & C & D \end{array} \\ \begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix} \end{array}$$

b) Show matrix operations representing the number of connections through at most one other town.

(1 mark)

$$A + A^2 = \begin{array}{c} \\ A \\ B \\ C \\ D \end{array} \begin{array}{c} \begin{array}{cccc} A & B & C & D \end{array} \\ \begin{bmatrix} 3 & 2 & 2 & 1 \\ 2 & 2 & 2 & 1 \\ 2 & 2 & 2 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix} \end{array}$$

c) **Which town is the least accessible through exactly one other town? Support your answer.**

(2 marks)

$$A^2 = \begin{array}{c} \\ A \\ B \\ C \\ D \end{array} \begin{array}{c} \begin{array}{cccc} A & B & C & D \end{array} \\ \begin{bmatrix} 3 & 1 & 1 & 0 \\ 1 & 2 & 1 & 1 \\ 1 & 1 & 2 & 1 \\ 0 & 1 & 1 & 1 \end{bmatrix} \end{array}$$

Drudgery is only accessible from 3 routes, where each of the others have 5 routes.

OR

Drudgery is the least accessible through exactly one town because you can only go through Appletown to reach it.

Marker Notes:

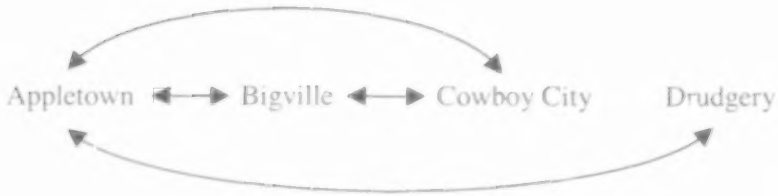
- *Maximum ½ mark deduction for each kind of technical communication error (incorrect use of brackets on matrices).*

Marking Key
1 mark for correct answer in a)
1 mark for correct matrix operations in b)
1 mark for correct answer in c)
1 mark for support in c)

Student exemplar 1

11. The following diagram represents network connections among four communities.

Total: 4 marks



a) Create a direct route matrix that shows the number of connections among communities.

(1 mark)

$$\begin{array}{c} \\ AT \\ BV \\ CC \\ D \end{array} \begin{array}{c} \begin{array}{cccc} AT & BV & CC & D \end{array} \\ \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 0 \\ 1 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 \end{bmatrix} \end{array}$$

b) Show matrix operations representing the number of connections through at most one other town.

(1 mark)

$$\begin{bmatrix} 4 & 3 & 3 & 2 \\ 3 & 3 & 3 & 1 \\ 3 & 3 & 3 & 1 \\ 2 & 1 & 1 & 2 \end{bmatrix}$$

c) Which town is the least accessible through exactly one other town? Support your answer.

(2 marks)

Drudgery - cause you have to fly through Appletown to get there

2 marks:

- 0 mark for a)
- 0 mark for b) even with error in a)
- 2 marks for c)

Specific Outcomes: A2 | Item Type: Restricted Response

Question No. 12 and Answer

Total: 3 marks

12. **In the Manitoba Fantasy Baseball league, players on protected lists are often traded.**

Each season:

- **The Baldur Bruins release 3% of their players to the Selkirk Stingrays.**
- **The Stingrays send 2% of their players back to the Bruins.**

The Bruins start with 78 players and the Stingrays begin with 62 players.

Create a transition matrix which describes player movement and use it to calculate the number of players on each team after one season.

$$\text{From} \quad \begin{array}{c} \\ B \\ S \end{array} \overset{\text{To}}{\begin{array}{cc} B & S \\ \end{array}} \begin{bmatrix} 0.97 & 0.03 \\ 0.02 & 0.98 \end{bmatrix}$$

$$\begin{array}{cc} B & S \end{array}$$

$$[78 \quad 62] \begin{bmatrix} 0.97 & 0.03 \\ 0.02 & 0.98 \end{bmatrix} = [77 \quad 63]$$

BRUINS 77 PLAYERS
STINGRAYS 63 PLAYERS

Marker Notes:

- *Maximum ½ mark deduction for each kind of technical communication error (incorrect use of brackets on matrices or not expressing transition matrices as decimals or percentages).*

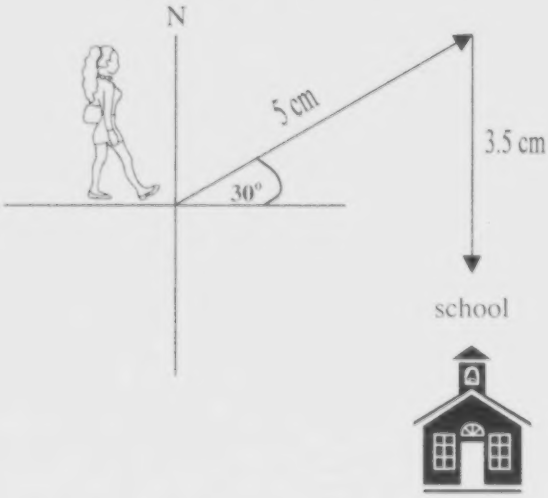
Marking Key
1 mark for correct diagonal
1 mark for rest of the matrix
1 mark for correct product matrix (or correct numbers of players)

Question No. 13 and Answer

13. To walk to school, Angie follows the path shown by the vector diagram below.

Total: 3 marks

1 cm = 0.5 km



a) Calculate the resultant vector.

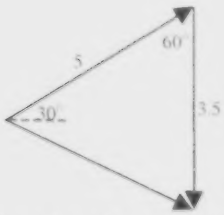
(2 marks)

Scale: 1 cm = 0.5 km

$\bar{r}$ = 4.5 cm or 2.25 km

12° S of E or E 12° S

or Bearing 102°



$$a^2 = b^2 + c^2 - 2bc\cos A$$
$$= 5^2 + 3.5^2 - 2(5)(3.5)\cos 60$$
$$= 19.7$$
$$a = 4.4$$

b) **What does the resultant vector represent in this situation?**

(1 mark)

Direct route from Angie to the school.

Marker Notes:

- *Maximum ½ mark deduction for each kind of technical communication error (missing more than one vector head).*
- *± 3 mm, $\pm 3°$*
- *The answer must indicate direction from Angie to the school.*

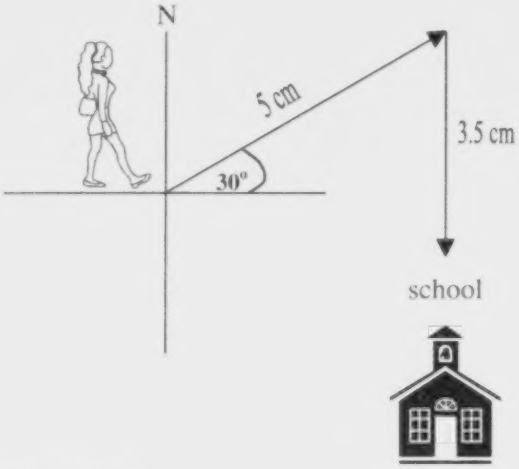
Marking Key
1 mark for correct magnitude in a) *1 mark for correct direction in a)* *1 mark for correct answer in b)*

Student exemplar 1

13. To walk to school, Angie follows the path shown by the vector diagram below.

Total: 3 marks

1 cm = 0.5 km



a) Calculate the resultant vector.

(2 marks)

$b^2 = a^2 + c^2 - 2(a)(c)\cos B$

$b^2 = 1.5^2 + 2^2 - 2(1.5)(2)(\cos 60)$

b^2 3.25 $b = 1.80$ km

$\boxed{1.80\text{ km @ a bearing of } 106^\circ}$

$2\,\frac{\sin 60}{1.8} = \frac{\sin C}{2}$

$\sin C = .9622$

$\sin^{-1} = 74.20$

$\frac{\sin 60}{1.8} = \frac{\sin A}{1.5}$

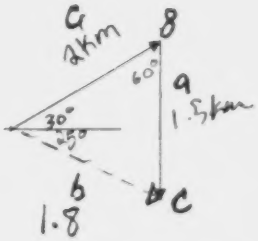
$= .7216$

$\sin^{-1} = 46^\circ$

b) What does the resultant vector represent in this situation?

(1 mark)

The short direct root to School



2 marks:

- 1 mark for magnitude in a)
- 0 mark for direction in a)
- 1 mark for answer in b)

Question No. 14 and Answer

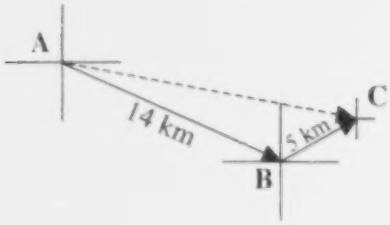
14. **Fred is currently participating in an Adventure Race, and is using a compass to navigate in the wilderness. He is at station A. Station B is located 14 km away in the direction E 24° S from his current position. Station C is located 5 km from station B at E 29° N.**

Total: 6 marks

a) **What is Fred's most direct route to station C? Include distance and direction. Show your work.**

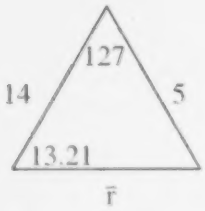
(3 marks)

1 km = 0.25 cm



$\bar{r}$ = 17.47 km at 10.79° S of E

Trisolve

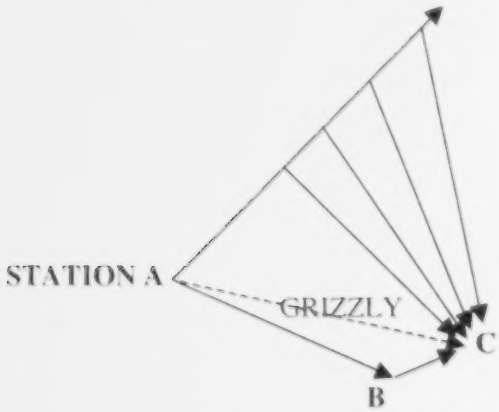


$$\begin{array}{r} 24 \\ -\ 13.21 \\ \hline 10.79 \end{array}$$

b) **The competitors have been alerted that grizzly bears have been seen midway along the routes. Draw an alternate route from station A to station C, where Fred must start travelling NE to avoid the grizzly bears. Give all distances and directions.**

(3 marks)

Answers will vary



One possible route :
Travel Northeast for 10km and then travel S44.3°E for 14.4km

Question No. 14 continued

Scoring Rubric

General Performance Indicators		
Level 1 - limited understanding		
1 mark **weak attempt, inappropriate strategy or no strategy** 1 criterion correct	**2 marks** **reasonable attempt, appropriate strategy with major errors or omissions** 2 criteria correct	
Level 2 - good understanding		
3 marks **reasonable strategy, minor errors and/or omissions** 3 criteria correct	**4 marks** **sound strategy, mostly complete, minor errors** 4 criteria correct	**5 marks** **almost complete and correct** 5 criteria correct
Level 3 - exceptional understanding		
6 marks **complete and correct, reflecting exceptional understanding** 6 criteria correct		

Marker Notes:

- *Maximum ½ mark deduction for each kind of technical communication error (missing more than one vector head in a response or not stating a scale when using a scale diagram as a strategy).*
- ***± 3 mm, ± 3°***

Marking Key
1 mark for work shown indicating an appropriate strategy in a) *1 mark for correct magnitude in a)* *1 mark for correct direction in a)* *1 mark for route starting in NE direction in b)* *1 mark for correct magnitudes of vectors in b)* *1 mark for correct direction of vectors in b)*

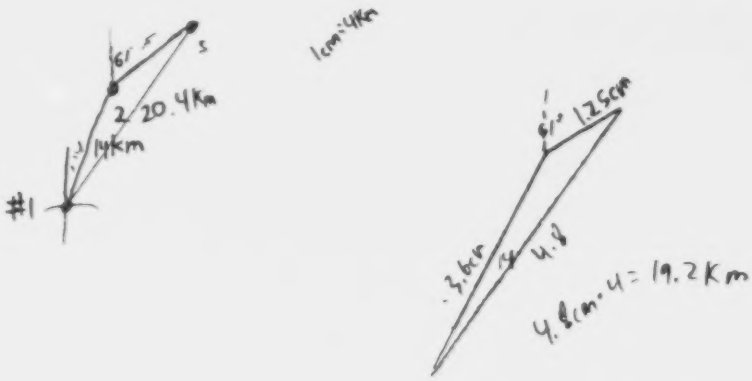
Student exemplar 1

14. Fred is currently participating in an Adventure Race, and is using a compass to navigate in the wilderness. He is at station A. Station B is located 14 km away in the direction E 24° S from his current position. Station C is located 5 km from station B at E 29° N.

Total: 6 marks

a) What is Fred's most direct route to station C? Include distance and direction. Show your work.

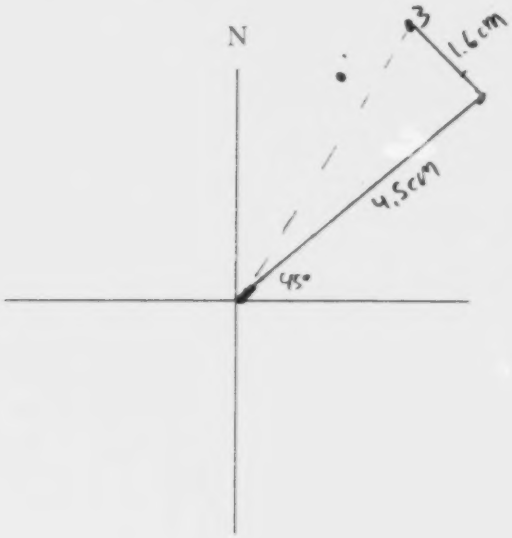
(3 marks)



b) The competitors have been alerted that grizzly bears have been seen midway along the routes. Draw an alternate route from station A to station C, where Fred must start travelling NE to avoid the grizzly bears. Give all distances and directions.

(3 marks)

1 cm: 4km



4.5 + 1.6 = 6.1 × 4
= 24.4 km

1.5 marks:

- 1 mark for strategy in a)
- 1 mark for NE direction in b)
- 0.5 mark deduction for missing vector heads

Student exemplar 2

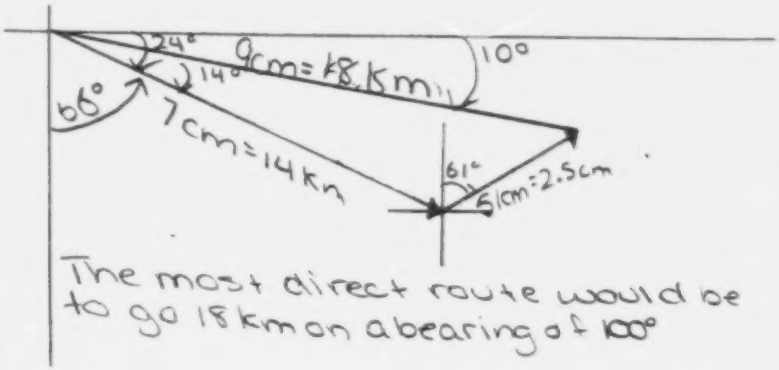
14. Fred is currently participating in an Adventure Race, and is using a compass to navigate in the wilderness. He is at station A. Station B is located 14 km away in the direction E 24° S from his current position. Station C is located 5 km from station B at E 29° N.

Total: 6 marks

a) What is Fred's most direct route to station C? Include distance and direction. Show your work.

(3 marks)

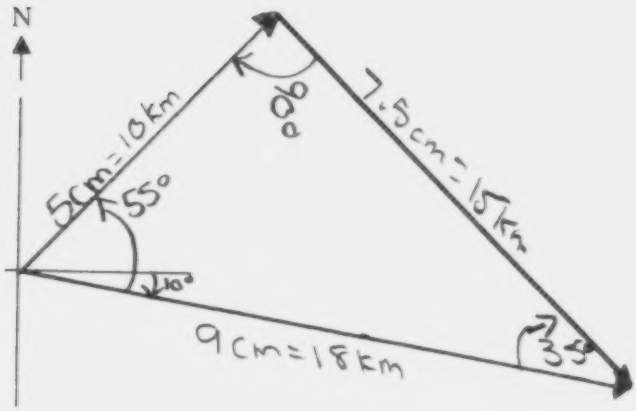
1 km = .5cm



The most direct route would be to go 18 km on a bearing of 100°

b) The competitors have been alerted that grizzly bears have been seen midway along the routes. Draw an alternate route from station A to station C, where Fred must start travelling NE to avoid the grizzly bears. Give all distances and directions.

(3 marks)



5 marks:

- 1 mark for strategy in a)
- 1 mark for magnitude in a)
- 1 mark for direction in a)
- 1 mark for NE direction in b)
- 1 mark for magnitude in b)
- 0 mark for direction in b)

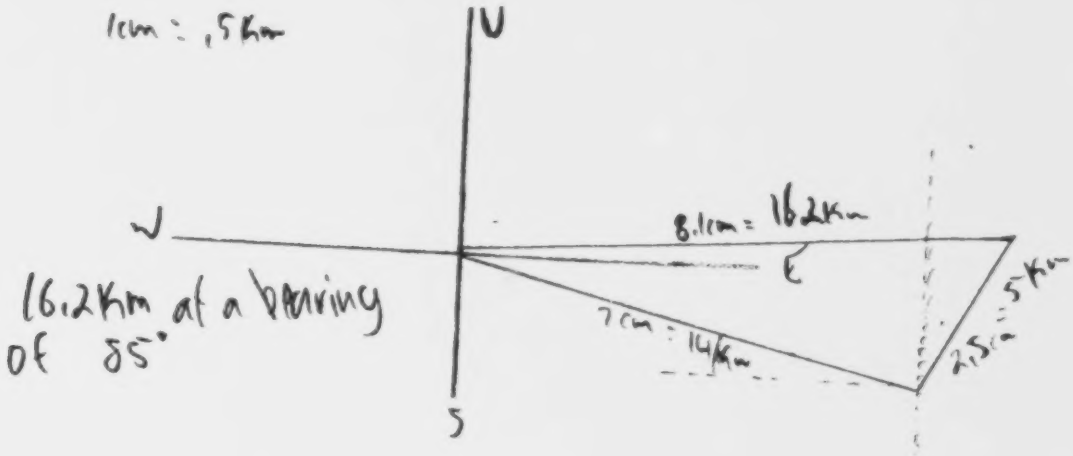
Student exemplar 3

Total: 6 marks

14. Fred is currently participating in an Adventure Race, and is using a compass to navigate in the wilderness. He is at station A. Station B is located 14 km away in the direction E 24° S from his current position. Station C is located 5 km from station B at E 29° N.

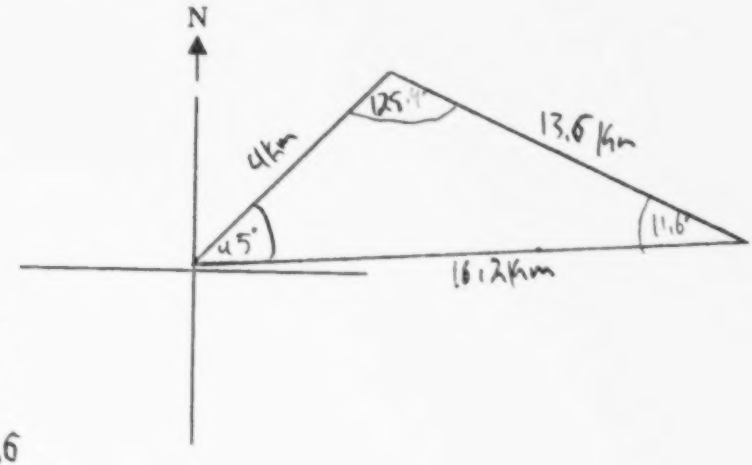
a) What is Fred's most direct route to station C? Include distance and direction. Show your work.

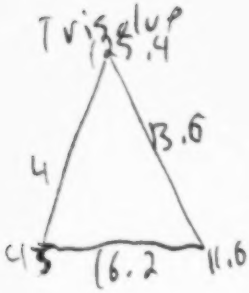
(3 marks)



b) The competitors have been alerted that grizzly bears have been seen midway along the routes. Draw an alternate route from station A to station C, where Fred must start travelling NE to avoid the grizzly bears. Give all distances and directions.

(3 marks)





2.5 marks:

- 1 mark for strategy in a)
- 1 mark for NE direction in b)
- 1 mark for magnitude based on error in a)
- -0.5 mark for missing vector heads

Specific Outcomes: D1 | Item Type: Restricted Response

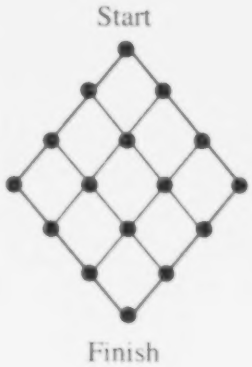
DO NOT USE

105

Question No. 15 and Answer

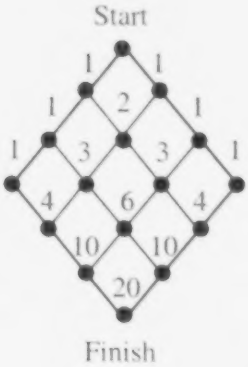
Total: 3 marks

15. **A maze through a corn field is created in the shape of a diamond. A person can move from point to point along the pathways throughout the maze in a direction heading toward the finish.**



a) **Determine the total number of pathways possible from start to finish. Support your answer.**

(2 marks)



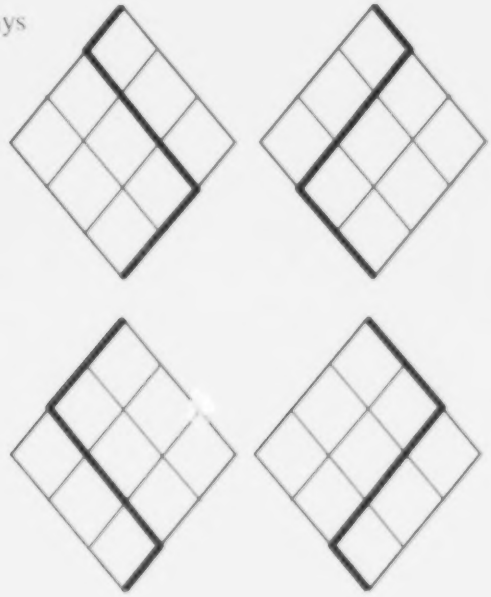
20 paths

b) **If a person was restricted to exactly two turns in the maze, how many pathways would be possible from start to finish?**

(1 mark)

1 turn → 2 ways
2 turns → 4 ways
3 turns → 8 ways
4 turns → 4 ways
5 turns → 2 ways

4 ways

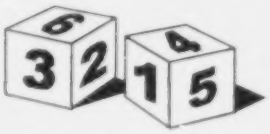


Marking Key
1 mark for work shown indicating an appropriate strategy in a) *1 mark for correct answer in a)* *1 mark for correct answer in b)*

Specific Outcomes: D3, D4, D5 **Item Type: Open Response**

Question No. 16 and Answer

16. You toss two cubes, each numbered 1 to 6.



Total: 4 marks

a) What is the probability of getting two odd numbers that are both less than 4? Show your work.

(2 marks)

$$P(2\ odd < 4)\ \frac{2}{6}\cdot\frac{2}{6}=\frac{4}{36}=\frac{1}{9}$$

b) Using the number cubes, give an example of two events, M and N, that are <u>not</u> mutually exclusive. Calculate the probability P(M or N).

(2 marks)

Example 1:

M: Both cubes could be even numbers

N: could be doubles

$$P(M)=\frac{1}{2}\times\frac{1}{2}=\frac{1}{4}$$

$$P(N)=\left(\frac{1}{6}\times\frac{1}{6}\right)\times 6=\frac{1}{6}$$

$$P(M\text{ or }N)=P(M)+P(N)-P(M\text{ and }N)$$
$$=\frac{1}{4}+\frac{1}{6}-\frac{1}{12}$$
$$=\frac{3}{12}+\frac{2}{12}-\frac{1}{12}$$
$$=\frac{4}{12}\text{ or }0.33$$

Example 2:

M: sum of cubes = 9

N: sum of cubes = a perfect square

$$P(M)=\frac{4}{36}=\frac{1}{9}$$

$$P(N)=\frac{7}{36}$$

$$P(M\text{ or }N)=P(M)+P(N)-P(M\text{ and }N)$$
$$\frac{4}{36}+\frac{7}{36}-\frac{4}{36}=\frac{7}{36}$$

Question No. 16 continued

Scoring Rubric

General Performance Indicators	
Level 1 - limited understanding	
1 mark **weak attempt, inappropriate strategy or no strategy** 1 criterion correct	
Level 2 - good understanding	
2 marks **reasonable attempt, appropriate strategy, minor errors and/or omissions** 2 criteria correct	**3 marks** **complete and correct with minor errors** 3 criteria correct
Level 3 - exceptional understanding	
4 marks **complete and correct, reflecting exceptional understanding** 4 criteria correct	

Marking Key
1 mark for work shown indicating an appropriate strategy in a) *1 mark for correct answer in a)* *1 mark for an appropriate description of events M and N (not mutually exclusive)* *1 mark for correct probability (M or N) in b)*

Student exemplar 1

16. You toss two cubes, each numbered 1 to 6.

Total: 4 marks

a) What is the probability of getting two odd numbers that are both less than 4? Show your work.

(2 marks)

$2/6 \times 2/6 = 1/9$

You have a 1 out of 9 chance that both dice are going to roll a 1 or a 3

b) Using the number cubes, give an example of two events, M and N, that are not mutually exclusive. Calculate the probability P(M or N).

(2 marks)

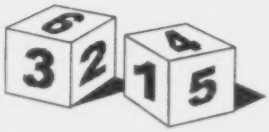
-What is the probability of rolling an even number on 1 cube and a 6 on the other cube.

$3/6 \times 1/6 = 1/12$

2 marks:
- 1 mark for strategy in a)
- 1 mark for answer in a)
- 0 mark for b)

Student exemplar 2

16. You toss two cubes, each numbered 1 to 6.



Total: 4 marks

a) What is the probability of getting two odd numbers that are both less than 4? Show your work.

(2 marks)

$2/6 = 1/3 \times 1/3 = 1/9$

b) Using the number cubes, give an example of two events, M and N, that are not mutually exclusive. Calculate the probability P(M or N).

(2 marks)

P(M or N)

rolling two 3's at the same time (M) or
rolling two odd #s at the same time (N)

P(

$1/6 \times 1/6 = 1/36 = M$

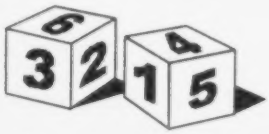
$3/6 \times 3/6 = 1/4 = N$

3 marks:

- 1 mark for strategy in a)
- 1 mark for answer in a)
- 1 mark for description in b)
- 0 mark for correct probability in b)

Student exemplar 3

16. You toss two cubes, each numbered 1 to 6.



Total: 4 marks

a) What is the probability of getting two odd numbers that are both less than 4? Show your work.

(2 marks)

$1/9$

b) Using the number cubes, give an example of two events, M and N, that are not mutually exclusive. Calculate the probability P(M or N).

(2 marks)

A > Both dice are even

B > sum less than 6

$P(A) = 9/36$

$P(A \cap B) = 1/36$

$P(B) = 10/36$

3 marks:

- 1 mark for correct answer in a)
- 1 mark for description in b)
- 1 mark for correct probabilities (mutually inclusive)

Question No. 17 and Answer

Total: 4 marks

17. As part of an annual plan, a research firm surveyed several communities and gathered the following data. The table shows the number of children from 98 families selected at random.

Number of children	Number of families
0	6
1	13
2	20
3	24
4	19
5	11
6	5

a) Calculate the population standard deviation for the number of children in each family.

(1 mark)

$$\sigma = 1.54$$

b) Explain how the data in this situation compares to a normal distribution. Justify your answer.

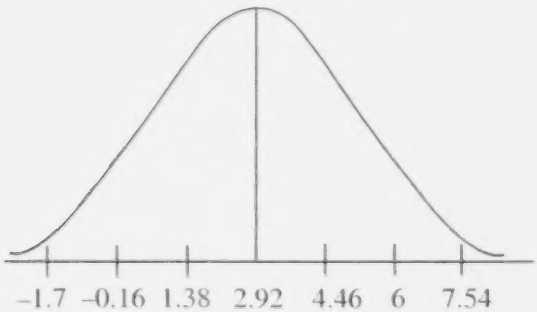
(2 marks)

$$\bar{x} = 2.92$$
$$\sigma = 1.54$$

-1σ to 1σ
range is 1.38 to 4.46 } 63/98 or 64% numbers fall in this range (normal should be 68%)

-2σ to 2σ
range is –0.16 to 6 } 98/98 all numbers fall in this range

100% of all numbers fall in the $\pm\ 2\sigma$ instead of 95% so therefore it's not normal.



c) **In another province, a similar survey was found to be normally distributed with a mean of 2.92 and a standard deviation of 1.61. Use normal distributions to compare the number of children in each family in the two surveys.**

(1 mark)

In first community 64% are $\pm 1\ \sigma$ while in second community 68% are $\pm 1\ \sigma$.

or

In first community 100% are $\pm 2\ \sigma$ while in second community 95% are $\pm 2\ \sigma$.

Question No. 17 continued

Scoring Rubric

General Performance Indicators	
Level 1 - limited understanding	
1 mark **weak attempt, inappropriate strategy or no strategy** 1 criterion correct	
Level 2 - good understanding	
2 marks **reasonable attempt, appropriate strategy, minor errors and/or omissions** 2 criteria correct	**3 marks** **complete and correct with minor errors** 3 criteria correct
Level 3 - exceptional understanding	
4 marks **complete and correct, reflecting exceptional understanding** 4 criteria correct	

Marking Key
1 mark for correct answer in a) *1 mark for showing at least $\pm 2\sigma$ in b)* *1 mark for relating answer to 68 – 95 – 99.7 in b)* *1 mark for correct comparison in c)*

Student exemplar 1

17. As part of an annual plan, a research firm surveyed several communities and gathered the following data. The table shows the number of children from 98 families selected at random.

Total: 4 marks

Number of children	Number of families
0	6
1	13
2	20
3	24
4	19
5	11
6	5

a) Calculate the population standard deviation for the number of children in each family.

(1 mark)

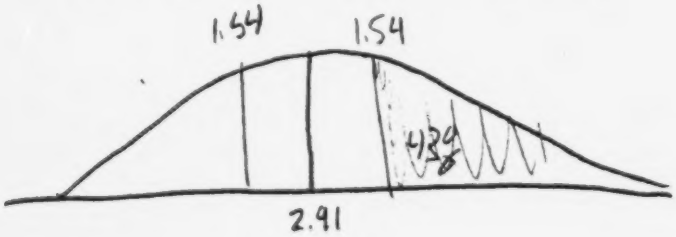
enter data the [Stat] [1] L1, L2

$\sigma = 1.543$

b) Explain how the data in this situation compares to a normal distribution. Justify your answer.

(2 marks)

This data compares to 43% on a normal distro ~~curve~~ curve



c) In another province, a similar survey was found to be normally distributed with a mean of 2.92 and a standard deviation of 1.61. Use normal distributions to compare the number of children in each family in the two surveys.

(1 mark)

100%-43 = 57%

1 mark:

- 1 mark for a)

Student exemplar 2

17. As part of an annual plan, a research firm surveyed several communities and gathered the following data. The table shows the number of children from 98 families selected at random.

Total: 4 marks

Number of children	Number of families
0	6
1	13
2	20
3	24
4	19
5	11
6	5

a) Calculate the population standard deviation for the number of children in each family.

(1 mark)

Standard deviation = 1.55

b) Explain how the data in this situation compares to a normal distribution. Justify your answer.

(2 marks)

The data in this situation does not represent normal distribution because it does not follow the 68% 95%-99% Rule.

c) In another province, a similar survey was found to be normally distributed with a mean of 2.92 and a standard deviation of 1.61. Use normal distributions to compare the number of children in each family in the two surveys.

(1 mark)

2 marks:
- 1 mark for a)
- 1 mark for using 68-95-99 rule in b)

Student exemplar 3

17. As part of an annual plan, a research firm surveyed several communities and gathered the following data. The table shows the number of children from 98 families selected at random.

Total: 4 marks

Number of children	Number of families
0	6
1	13
2	20
3	24
4	19
5	11
6	5

a) Calculate the population standard deviation for the number of children in each family.

(1 mark)

$\sigma = 1.54$

b) Explain how the data in this situation compares to a normal distribution. Justify your answer.

(2 marks)

The data is not normal because:
Between -2σ and 2σ all 98 of the families fall into this category.
$\therefore$ 100% are within 2 s.d. when it should only be 95% to be a normal distribution.

c) In another province, a similar survey was found to be normally distributed with a mean of 2.92 and a standard deviation of 1.61. Use normal distributions to compare the number of children in each family in the two surveys.

(1 mark)

Since the distribution in b) is not normal and the distribution in c) is normal, then 68% of the data with be within 1 s.d. of the mean in c).

4 marks:

- 1 mark for a)
- 1 mark for $\pm 2\sigma$ in b)
- 1 mark for comparing to 68-95 rule
- 1 mark for comparison in c)

Specific Outcomes: E1, E3 Item Type: Restricted Response with Explanation

Question No. 18 and Answer

18. **A department store's shoe sales are famous. Based on the sales for the ten previous years they expect that 89% of their shoes on sale will be sold. The department store will have 400 pairs of running shoes on sale this weekend.**

Total: 4 marks

a) **Calculate the number of pairs of shoes they expect to sell (mean) this weekend and the standard deviation based on this information.**

(2 marks)

$m = np = 400\,(0.89) = 356$

$s = \sqrt{npq} = \sqrt{400(0.89)(0.11)} = 6.26$

b) **Find the 95% confidence interval for the number of pairs of shoes that will be sold this weekend.**

(1 mark)

1 Prop Z-int	$\mu \pm 1.96\sigma$
x = 356	$356 \pm 1.96\,(6.26)$
n = 400	(343.73, 368.27)
C-level = 95	
(0.85934, 0.92066)	
$0.85934 \times 400 \quad 0.92066 \times 400$	
(343.74, 368.26)	

c) **Would the 99% confidence interval for this data be smaller, the same, or larger than the 95% confidence interval? Explain why.**

(1 mark)

The 99% confidence interval would be larger because 339.88 – 372.12 is larger than 343.73 – 368.27, the 95% confidence interval.

or

The 99% confidence interval would be larger because as the certainty increases, so does the size of the target.

Marking Key
1 mark for mean in a)
1 mark for standard deviation in a)
1 mark for correct answer in b)
1 mark for correct explanation in c)

Student exemplar 1

18. A department store's shoe sales are famous. Based on the sales for the ten previous years they expect that 89% of their shoes on sale will be sold. The department store will have 400 pairs of running shoes on sale this weekend.

Total: 4 marks

a) Calculate the number of pairs of shoes they expect to sell (mean) this weekend and the standard deviation based on this information.

(2 marks)

$\mu = np = (400)(.89) = \boxed{356}$

$\sigma = \sqrt{npq} = \sqrt{(400)(.89)(.11)} = \sqrt{39.16} = \boxed{6.26}$

b) Find the 95% confidence interval for the number of pairs of shoes that will be sold this weekend.

(1 mark)

c) Would the 99% confidence interval for this data be smaller, the same, or larger than the 95% confidence interval? Explain why.

(1 mark)

The confidence interval would be larger because there must be a wider range of sales to be more sure.

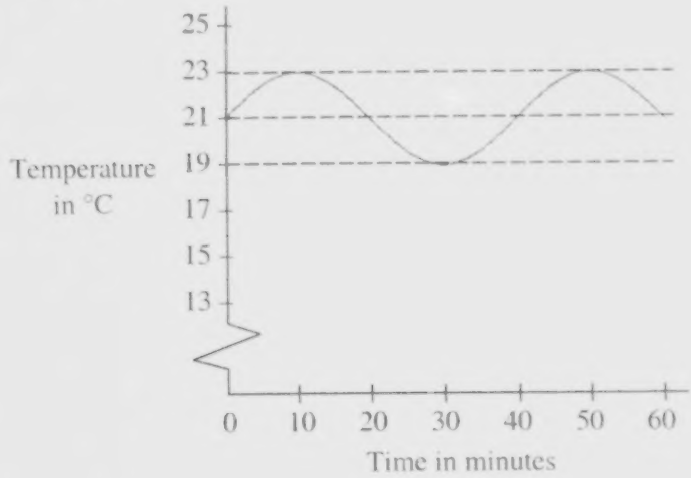
3 marks:

- 1 mark for mean in a)
- 1 mark for standard deviation in a)
- 0 mark for confidence interval in b)
- 1 mark for correct explanation in c)

Question No. 19 and Answer

19. **A thermostat keeps the temperature in a room between 19° and 23°C, as shown in the graph.**

Total: 6 marks



a) **Write an equation for this sinusoidal function.**

(2 marks)

$$a = 2$$

$$b = \frac{6.28}{p} = \frac{6.28}{40} = 0.157$$

$$c = 0$$
$$d = 21$$

$$y = 2\sin(0.157x) + 21$$

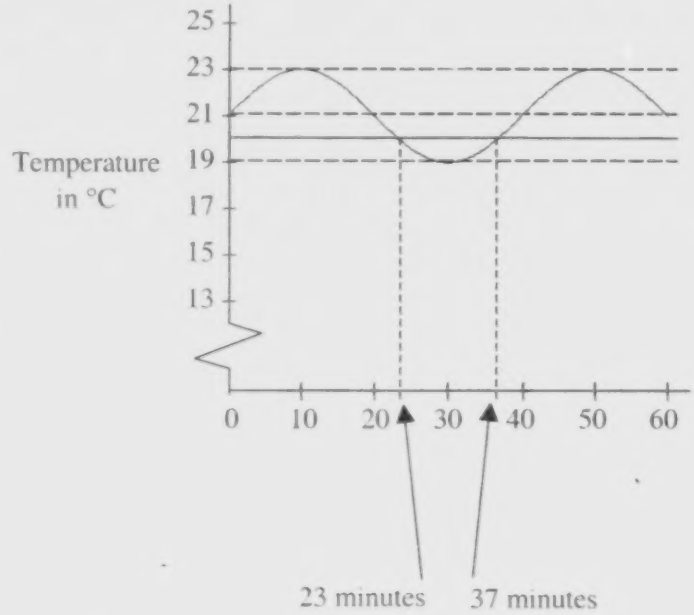
b) **An imported tropical bird becomes agitated when the temperature drops below 20° C. For how long during the first hour will the bird be agitated in this room? Show how you arrived at your answer.**

(2 marks)

y = 20, x = 23.34

y = 20, x = 36.70

$$\begin{array}{r} 36.70 \\ -\ 23.34 \\ \hline 13.36 \text{ minutes} \end{array}$$



c) **Identify the period of the equation. What factor might cause the period to change?**

(2 marks)

40 minutes (from graph)

- Changing your thermostat setting
- The outside temperature
- Heat sources e.g., fireplace, heater...

Question No. 19 continued

Scoring Rubric

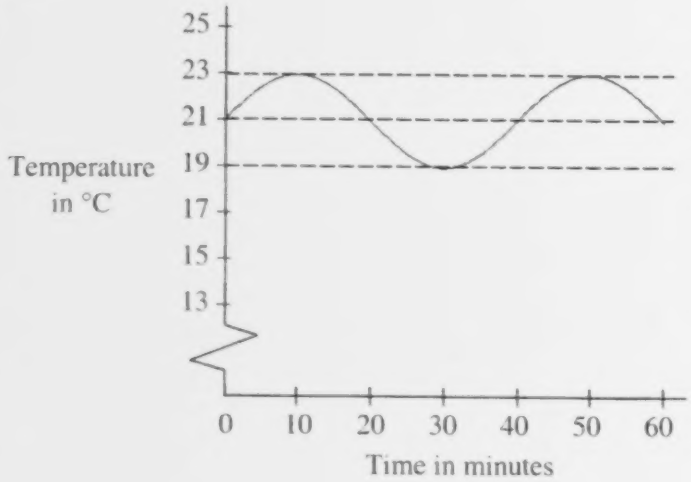
General Performance Indicators		
Level 1 - limited understanding		
1 mark **weak attempt, inappropriate strategy or no strategy** 1 criterion correct	**2 marks** **reasonable attempt, appropriate strategy with major errors or omissions** 2 criteria correct	
Level 2 - good understanding		
3 marks **reasonable strategy, minor errors and/or omissions** 3 criteria correct	**4 marks** **sound strategy, mostly complete, minor errors** 4 criteria correct	**5 marks** **almost complete and correct** 5 criteria correct
Level 3 - exceptional understanding		
6 marks **complete and correct, reflecting exceptional understanding** 6 criteria correct		

Marking Key
2 marks for correct equation in a) (0.5 mark per parameter) *1 mark for work shown indicating an appropriate strategy in b)* *1 mark for correct answer in b)* *1 mark for correct answer for period in c)* *1 mark for appropriate factor in c)*

Student exemplar 1

19. A thermostat keeps the temperature in a room between 19° and 23°C, as shown in the graph.

Total: 6 marks



a) Write an equation for this sinusoidal function.

(2 marks)

b) An imported tropical bird becomes agitated when the temperature drops below 20° C. For how long during the first hour will the bird be agitated in this room? Show how you arrived at your answer.

(2 marks)

This bird will be uncomfortable for around 10 mins. I just used a ruler and measured.

c) Identify the period of the equation. What factor might cause the period to change?

(2 marks)

If say there was a problem with the heater. This could cause a change in the peroide.

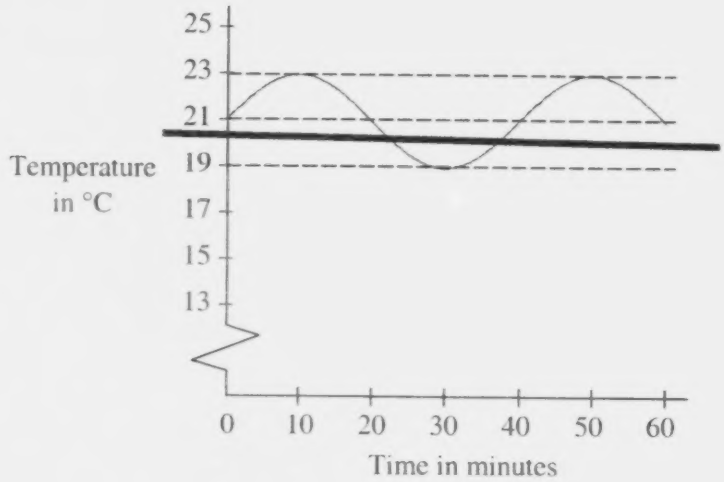
2 marks:

- 0 mark in a), incomplete
- 1 mark for strategy in b), incorrect answer
- 1 mark for correct factor in c), period missing

Student exemplar 2

19. A thermostat keeps the temperature in a room between 19° and 23°C, as shown in the graph.

Total: 6 marks



a) Write an equation for this sinusoidal function.

(2 marks)

a) $\frac{23-19}{2} = 2$

b) $\frac{2\pi}{40} = 0.16$

c) 0

d) 21

$y = 2\sin 0.16(x) + 21$

b) An imported tropical bird becomes agitated when the temperature drops below 20° C. For how long during the first hour will the bird be agitated in this room? Show how you arrived at your answer.

(2 marks)

40 - 20 = 20 minutes

for approximately 20 minutes.

c) Identify the period of the equation. What factor might cause the period to change?

(2 marks)

$2\pi/40$ Depends what temperature you started at, or what time of day.

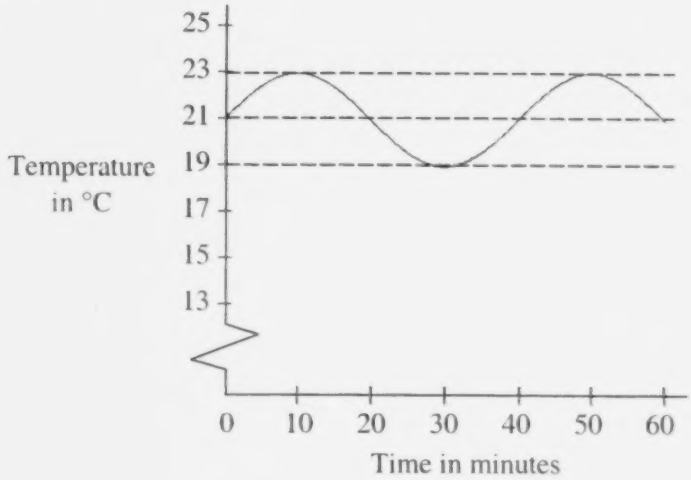
3 marks:

- 2 marks for a)
- 1 mark for strategy in b) (line on graph)
- 0 mark of c)

Student exemplar 3

19. A thermostat keeps the temperature in a room between 19° and 23°C, as shown in the graph.

Total: 6 marks



a) Write an equation for this sinusoidal function.

(2 marks)

$y = 2\sin\left(\frac{\pi}{20}x\right) + 21$

$a = \frac{23-19}{2} = 2$

$b = \frac{2\pi}{40} = \pi/20$

$c = 0$

$d = 23 - 2$

$= 21$

b) An imported tropical bird becomes agitated when the temperature drops below 20° C. For how long during the first hour will the bird be agitated in this room? Show how you arrived at your answer.

(2 marks)

$0 - 22.5 = 22.5$ min

$38 - 60 = 22$ min

44.5

The bird will be comfortable for 44.5 min in the first hour

c) Identify the period of the equation. What factor might cause the period to change?

(2 marks)

$$P = \frac{2\pi}{b} = \frac{2\pi}{\pi/20} = 2\pi \cdot \frac{20}{\pi} = 40 \text{ min}$$

A change in the range might cause the period to change

4 marks:

- 2 marks for a)
- 1 mark for b) (misinterpreted when the bird is agitated)
- 1 mark for c) (correct period, incorrect factor)

Specific Outcomes: G3 | Item Type: Restricted Response

Question No. 20 and Answer

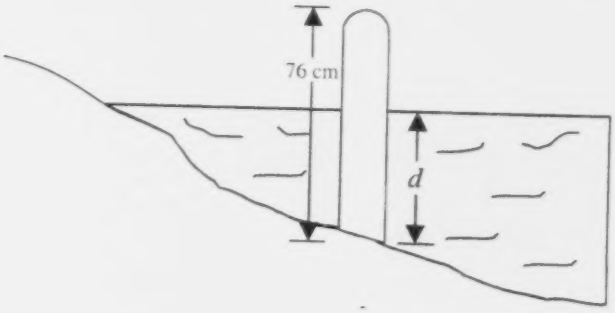
20. **At a certain point on the beach, a post sticks out of the sand, its top being 76 cm above the beach (as shown in the sketch). The depth (d) of the water at the post varies sinusoidally with time due to the motion of the tides.**

Total: 3 marks

The function that fits this situation is

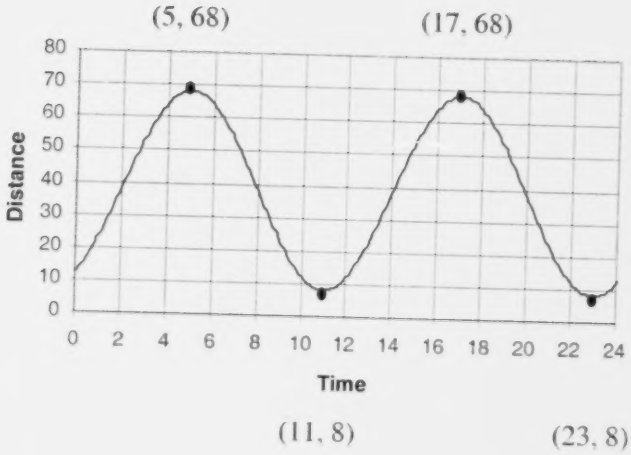
$d = 30\sin(0.524t - 1.05) + 38$

where d is depth and t is the number of hours after midnight.



a) **Sketch the graph of the function on the grid below. Complete a 24 hour span and clearly label your graph indicating the maximum and minimum.**

(2 marks)



b) **What is the difference between the water level at high tide and the top of the post?**

(1 mark)

8 cm

Marking Key
1 mark for graph showing 24 hour span in a)
1 mark for graph showing correct maximum and minimum in a)
1 mark for correct answer in b)

Question No. 21 and Answer

21. Currently a city has 986 occupied apartment suites. Every year, 12% of the renters move out of their apartments, while 122 new renters sign leases.

Total: 4 marks

a) How many apartments will be occupied after 5 years? Support your answer.

(2 marks)

Option 1

$986 \times 0.88 + 122 =$ 989.7

992.9 (2)

995.8 (3)

998.3 (4)

1000.5 (5)

Option 2

$(986 + 122) \times 0.88 =$ 975

965

957

949

942

OR

Seq. Mode

nMin = 0

$\mathbf{u}(n) = \mathbf{u}(n - 1)\ 0.88 + 122$

$\mathbf{u}(n\text{Min}) = (986)$

Seq. Mode

nMin = 0

$\mathbf{u}(n) = (\mathbf{u}(n - 1) + 122)\ 0.88$

$\mathbf{u}(n\text{Min}) = (986)$

b) **If these trends continue, how many apartments will be needed when stabilisation occurs? Use sequences to justify your answer.**

(2 marks)

Option 1: The number of apartments will stabilise at 1017 apartments.
Option 2: The number of apartments will stabilise at 895 apartments.

OR

Option 1

Seq. Mode

$n\text{Min} = 0$

$\mathbf{u}(n) = \mathbf{u}(n - 1)\,0.88 + 122$

$\mathbf{u}(n\text{Min}) = (986)$

OR

IT STABILIZES AT 1017

Marking Key
1 mark for work shown indicating an appropriate strategy in a)
1 mark for correct answer in a)
1 mark for correct answer in b)
1 mark for support (justification) in b)

Student exemplar 1

21. Currently a city has 986 occupied apartment suites. Every year, 12% of the renters move out of their apartments, while 122 new renters sign leases.

Total: 4 marks

a) How many apartments will be occupied after 5 years? Support your answer.

(2 marks)

986 − 12% = 867.68 + 122 = 988.7
cont.

990 People after 1 year
993 2
996 3
998 4
1000 People

There would be 1000 people after 5 years.

b) If these trends continue, how many apartments will be needed when stabilisation occurs? Use sequences to justify your answer.

(2 marks)

It would take about 37 years for It to stabalize at a population of 1016 people

4 marks:

- 1 mark for strategy in a)
- 1 mark for answer in a)
- 1 mark for answer in b)
- 1 mark for strategy in b)

Question No. 22 and Answer

22. The following instructions create a fractal pattern. Answer the questions in the space below.

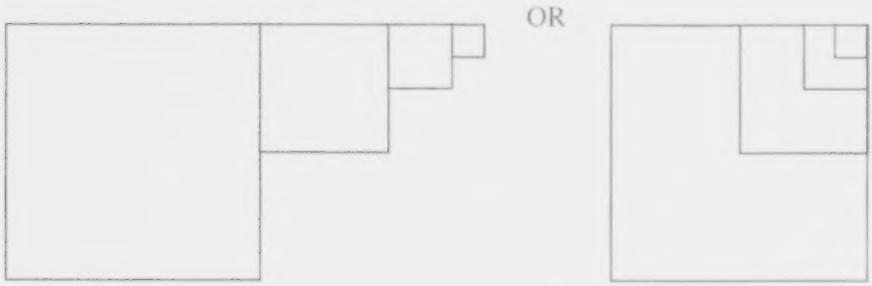
Total: 3 marks

generation 1 — **Sketch a square.**

generation 2 — **Sketch another square, ¼ the area of the previous square, such that it is attached to the previous square on the right side, and level with the top.**

a) Sketch the 4th generation of the fractal.

(1 mark)



b) Given that the area of the new square in the 6th generation of the fractal is 0.25 units² find the length of each side of the new square in the 2nd generation. Support your answer.

(2 marks)

$$\sqrt{0.25} = 0.5$$

Side length	Area	Generation
0.5	0.25	6
1	1	5
2	4	4
4	16	3
8	64	2
16	256	1

The length of each side in the 2nd generation is 8.

Marking Key
1 mark for correct answer in a)
1 mark for work shown indicating an appropriate strategy in b)
1 mark for correct answer in b)

Question No. 23 and Answer

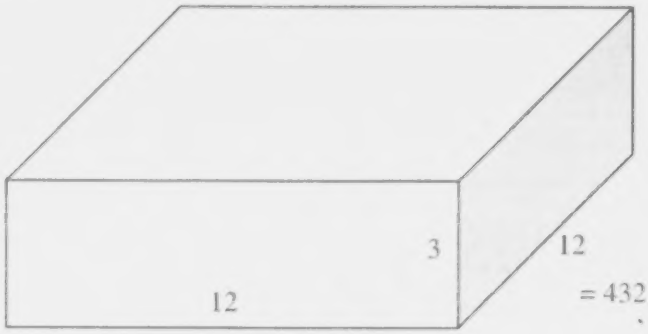
23. A wedding cake has square layers that are 3 inches tall. Each layer's side length is half as long as the length of the layer below it.

Total: 2 marks

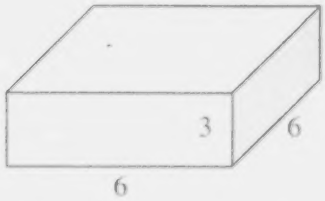
If each side of the base layer is 12 inches long, use sequences to calculate the volume of a cake with 4 layers.

Side length	Volume
12	432
6	108
3	27
1.5	6.75

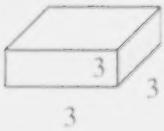
= 573.75 inches^3



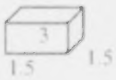
= 432



= 108



= 27



= 6.75

= 573.75 inches^3

Marker Notes:

- *common error: volume of 493.59 inches^3 (based on also halving the height of the cake 4 times) – full marks*

Marking Key
1 mark for correct answer *1 mark for work shown indicating an appropriate strategy*

Marking Keys and Scoring Rubrics for the Inquiry Task

Inquiry Task Question No. 1 and Answer

PERSONAL FINANCE

Total: 9 marks

1. **You have recently learned that you will inherit a sum of money. Your lawyer has contacted you to inform you of two payment options. You would like to invest the money, but you want to buy a car that costs $20 000.00 (taxes included). You consider the two options:**

Option 1: Receive $390 000.00 in one lump sum.
- **Pay cash for your car.**
- **Invest the remaining $370 000.00 at an interest rate of 4% per year compounded monthly.**

Option 2: Receive $4 000.00 a month for the next ten years.
- **Finance your car for 5 years at an interest rate of 5% per year compounded monthly.**
- **Invest the remaining monthly allowance at an interest rate of 3.8% compounded monthly.**

The car does not have a significant monetary value after ten years of use.

(1 mark) **One mark will be awarded for clearly showing your work or strategy and all calculated results.**

a) **In Option 1, what will be the final value of the investment after ten years?**

(1 mark)

TVM:

N = 120
I% = 4
PV = – 370 000
PMT = 0
FV = 551 608.09 **1 MARK**
P/Y = 12
C/Y = 12
PMT = END BEGIN

THE FUTURE VALUE OF THE INVESTMENT IS $551 608.09

b) **Determine the amount of the monthly car payment in Option 2.**

(1 mark)

TVM:

N = 60

I% = 5

PV = – 20 000

PMT = 377.42 1 MARK

FV = 0

P/Y = 12

C/Y = 12

PMT = END BEGIN

THE CAR PAYMENT IS $377.42

c) **What is the value of the Option 2 investment after the first 5 years?**

(2 marks)

For 5 years:

4000 – 377.42 = $3622.58/month

N	=	60
I%	=	3.8
PV	=	0
PMT	**=**	**–3622.58 1 MARK**
FV	**=**	**238 960.59 1 MARK**
P/Y	=	12
C/Y	=	12
PMT	=	END BEGIN

d) **What is the value of the Option 2 investment after the next 5 years?**

(2 marks)

For next 5 years:

N	=	60
I%	=	3.8
PV	=	238 960.59
PMT	**=**	**4000 1 MARK**
FV	**=**	**552 733.07 1 MARK**
P/Y	=	12
C/Y	=	12
PMT	=	END BEGIN

e) **Recommend an option and state 2 reasons for your choice.**

(2 marks)

Possible answers for e) option 1)

1. Car is paid for.
2. Lump sum of money which can be used whenever needed.
3. No finance charges or payments to make.
4. Interest rate may improve therefore you make more.

Possible answers for e) option 2)

1. Investment worth more after 10 years.
2. Security of a steady income of $4000.00 .
3. Maybe easier to budget.

Question No. 1 continued

Scoring Rubric

General Performance Indicators			
Level 1 – limited understanding			
1 mark **weak attempt, inappropriate strategy or no strategy** any combination of criteria for 1 mark	**2 marks** **reasonable attempt, inappropriate strategy, major errors or omissions** any combination of criteria for 2 marks	**3 marks** **reasonable attempt, inappropriate strategy but carried through correctly** any combination of criteria for 3 marks	
Level 2 - good understanding			
4 marks **sound strategy with major errors** any combination of criteria for 4 marks	**5 marks** **sound strategy with minor errors** any combination of criteria for 5 marks	**6 marks** **mostly complete with some omissions** any combination of criteria for 6 marks	**7 marks** **close to complete and correct, minor errors** any combination of criteria for 7 marks
Level 3 – exceptional understanding			
8 marks **almost complete and correct, trivial errors** any combination of criteria for 8 marks	**9 marks** **complete and correct, reflecting exceptional understanding** any combination of criteria for 9 marks		

Marking Key
1 mark for work shown indicating an appropriate strategy
1 mark for correct answer in a)
1 mark for correct answer in b)
1 mark for correct payment in c)
1 mark for correct future value in c)
1 mark for correct payment in d)
1 mark for correct future value in d)
1 mark for 1st appropriate reason in e)
1 mark for 2nd appropriate reason in e)

Student exemplar 1

1. You have recently learned that you will inherit a sum of money. Your lawyer has contacted you to inform you of two payment options. You would like to invest the money, but you want to buy a car that costs $20 000.00 (taxes included). You consider the two options:

Total: 9 marks

Option 1: Receive $390 000.00 in one lump sum.

- Pay cash for your car.
- Invest the remaining $370 000.00 at an interest rate of 4% per year compounded monthly.

Option 2: Receive $4 000.00 a month for the next ten years.

- Finance your car for 5 years at an interest rate of 5% per year compounded monthly.
- Invest the remaining monthly allowance at an interest rate of 3.8% compounded monthly.

The car does not have a significant monetary value after ten years of use.

(1 mark) **One mark will be awarded for clearly showing your work or strategy and all calculated results.**

a) In Option 1, what will be the final value of the investment after ten years?

(1 mark)

390 000.00
- 20 000.00
370 000.00

370 000.00 x 4% = 14800
14800 x 10 = 148000
370 000 + 148 000 =
$518000

b) Determine the amount of the monthly car payment in Option 2.

(1 mark)

There are 12 months in a year so if they were to pay every month and for 5 years they would only pay $377.42 a month for that car.

4 000 00 - 377.42 = 3622.58
12 x 5 = 60
So they would make 60 payments of $377.42

c) What is the value of the Option 2 investment after the first 5 years?

(2 marks)

4000.00 - 377.42 = $3622.58

3622.58 x 3.8% = 137.66

137.66 x 10 1376.60

3622.58 + 1376.60 = $\boxed{4999.18}$

d) What is the value of the Option 2 investment after the next 5 years?

(2 marks)

e) Recommend an option and state 2 reasons for your choice.

(2 marks)

Two reasons for choosing Option 1 is that you will have you car right away and be done paying for it. That way you won't have another debt to pay off. Also after 10 years the car has no monetary value.

5 marks:

- 1 mark for strategy
- 1 mark for answer in b)
- 1 mark for correct payment in c)
- 2 mark for reasons in e)

Student exemplar 2

1. You have recently learned that you will inherit a sum of money. Your lawyer has contacted you to inform you of two payment options. You would like to invest the money, but you want to buy a car that costs $20 000.00 (taxes included). You consider the two options:

Total: 9 marks

Option 1: Receive $390 000.00 in one lump sum.

- Pay cash for your car.
- Invest the remaining $370 000.00 at an interest rate of 4% per year compounded monthly.

Option 2: Receive $4 000.00 a month for the next ten years.

- Finance your car for 5 years at an interest rate of 5% per year compounded monthly.
- Invest the remaining monthly allowance at an interest rate of 3.8% compounded monthly.

The car does not have a significant monetary value after ten years of use.

(1 mark) **One mark will be awarded for clearly showing your work or strategy and all calculated results.**

a) In Option 1, what will be the final value of the investment after ten years?

(1 mark)

N = 120
I = 4
PV = -370,000
PMT = 0
FV = 551,605.09
P/Y = 12
C/Y = 12
PMT END

b) Determine the amount of the monthly car payment in Option 2.

(1 mark)

N = 60
I = 5
PV = -20,000
PMT =
FV = 0
P/Y = 12
C/Y = 12

Payment = $372.42

c) What is the value of the Option 2 investment after the first 5 years?

(2 marks)

N = 120
I = 3.5
PV = 0
PMT = - 3622.58
FV =
P/Y = 12
C/Y = 12.

Value = $527,836.86

d) What is the value of the Option 2 investment after the next 5 years?

(2 marks)

e) Recommend an option and state 2 reasons for your choice.

(2 marks)

Don't have car payments.
Don't have to pay interest on car payments

6 marks:

- 1 mark for strategy
- 1 mark for correct answer in a)
- 1 mark for correct answer in b)
- 1 mark for correct PMT in c)
- 2 marks for correct reasons in e)

Student exemplar 3

1. You have recently learned that you will inherit a sum of money. Your lawyer has contacted you to inform you of two payment options. You would like to invest the money, but you want to buy a car that costs $20 000.00 (taxes included). You consider the two options:

Total: 9 marks

Option 1: Receive $390 000.00 in one lump sum.

- Pay cash for your car.
- Invest the remaining $370 000.00 at an interest rate of 4% per year compounded monthly.

Option 2: Receive $4 000.00 a month for the next ten years.

- Finance your car for 5 years at an interest rate of 5% per year compounded monthly.
- Invest the remaining monthly allowance at an interest rate of 3.8% compounded monthly.

The car does not have a significant monetary value after ten years of use.

(1 mark) **One mark will be awarded for clearly showing your work or strategy and all calculated results.**

a) In Option 1, what will be the final value of the investment after ten years?

(1 mark)

390 000 - 20 000 = 370000

TVM Solver

N = 120
I% = 5
PV = -370 000
PMT = 0
*FV = 551608.09
P/Y = 12
C/Y = 12
END

The final value of the investment will be $551608.09 after 10 years.

b) Determine the amount of the monthly car payment in Option 2.

(1 mark)

TVM Solver

N = 60
I% = 5
PV = 4000
*PMT = -377.42
FV = 0
P/Y = 12
C/Y = 12
END

The monthly payment will be $377.42

c) What is the value of the Option 2 investment after the first 5 years?

(2 marks)

TVM Solver

N = 120
I% = 3.8
PV = -434709.60
PMT = 0
*FV = 635287.61
P/Y = 12
C/Y = 12
END

4000 - 377.42 = 3622.58
3622.58 × 120 = 434709.60

The final value of the investment will be $635287.61 after 10 years.

d) What is the value of the Option 2 investment after the next 5 years?

(2 marks)

e) Recommend an option and state 2 reasons for your choice.

(2 marks)

① no hastle of monthly payments on car
② don't pay intrest rate on car

5 marks:

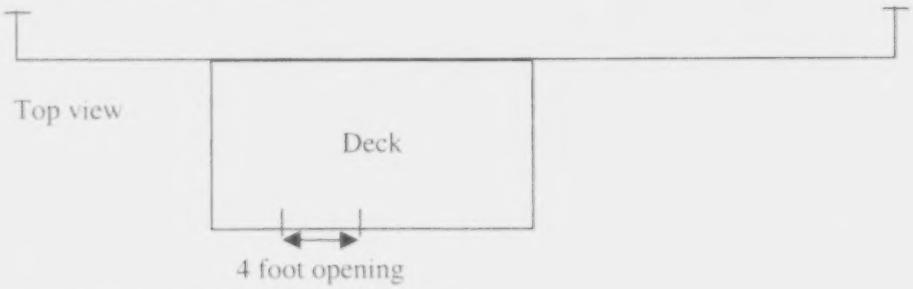
- 1 mark for strategy
- 1 mark for correct answer in a)
- 1 mark for correct answer in b)
- 1 mark for correct payment in c)
- 1 mark for reason in e)

Inquiry Task Question No. 2 and Answer

DESIGN AND MEASUREMENT

Total: 10 marks

2. A deck attached to the back of a house is to be repaired by replacing the floor of the deck and by putting up new railings. The existing frame will be reused, and the new floor will be built on top.



(1 mark) **GST and PST must be added to all costs.**

a) **The floor of the deck is 16 feet by 8 feet. Sheets of plywood are to be used to form the floor of the deck. Each sheet of plywood measures 4 feet by 8 feet and costs $21.95. Determine the cost to replace the plywood.**

(1 mark)

$4 \times 21.95 = \$87.80$

$87.80 + 6.15 + 6.15 = \$100.10$

b) **There are two options for protecting the floor from weather conditions.**

(3 marks)

Option A: Treat the floor with a waterproof stain. One gallon will cover 45 square feet and the floor will require 2 coats. Each gallon costs $34.95.

Option B: Cover the floor portion of the deck with an outdoor carpeting that costs $1.69 per square foot.

Calculate the cost for each option.

A : $16 \times 8 = 128$ sq.ft

128×2 coats $= 256$ sq.ft.

$256 \div 45 = 5.69$

6 cans

$6 \times 34.95 = \$209.70$

$209.70 + 14.68 + 14.68 = \$239.06$

B : $16 \times 8 = 128$ sq.ft.

$128 \times 1.69 = \$216.32$

$216.32 + 15.14 + 15.14 = \$246.60$

c) **Which option would you choose? Explain your choice.**

(1 mark)

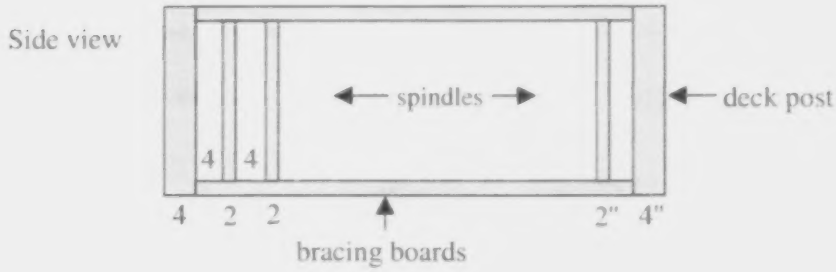
Option A is cheaper.

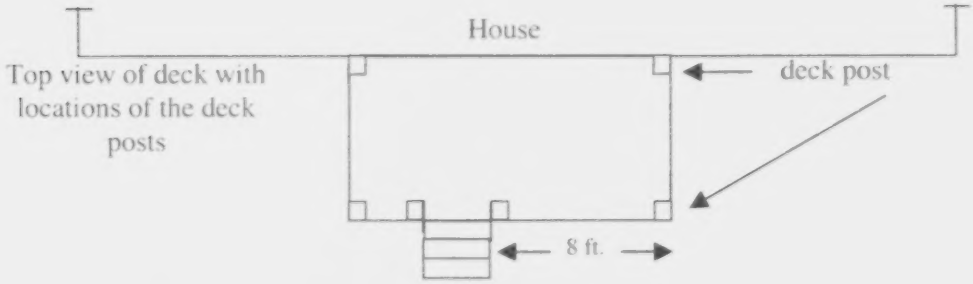
A person prefers paint to carpet or vice versa.

By carpeting, will not need to repaint.

d) **The sections of deck railing are built as shown below:**

(4 marks)





- **The deck posts are to be set at each corner of the deck and on each side of the opening of the deck. Each deck post is 4" wide.**
- **Each spindle is 2" wide and they are to be spaced 4 inches apart.**
- **The bracing boards are attached as shown above. They are sold only in 8 foot lengths.**

The costs for the materials are:

- **Deck posts are $4.59 each**
- **Bracing boards are $12.49 per 8 foot length**
- **Spindles are $1.55 each**

Determine the total cost of the materials needed to build the deck railing around the deck.

$$\begin{aligned} \underline{\text{Deck posts:}}\ 6 \times 4.59 &= 27.54 \\ \underline{\text{Bracing:}}\ 7 \times 12.49 &= 87.43 \\ \underline{\text{Spindles:}}\ 48 \times 1.55 &= \underline{74.40} \\ &\$189.37 \\ &13.26 \\ &\underline{13.26} \\ &\$215.89 \end{aligned}$$

$8' = 96''$

$96'' - 8'' - 4'' = 84''$

$\frac{84''}{6} = 14$

$14 \times 3 = 42$

$42 + 6 = 48$ spindles

$4' = 48''$

$48'' - 8'' - 4'' = 36''$

$\frac{36''}{6} = 6$

Question No. 2 continued

Scoring Rubric

General Performance Indicators			
Level 1 - limited understanding			
1 mark **weak attempt, inappropriate strategy or no strategy** any combination of criteria for 1 mark	**2 marks** **reasonable attempt, inappropriate strategy, major errors or omissions** any combination of criteria for 2 marks	**3 marks** **reasonable attempt, inappropriate strategy but carried through correctly** any combination of criteria for 3 marks	
Level 2 - good understanding			
4 marks **sound strategy with major errors** any combination of criteria for 4 marks	**5 marks** **sound strategy with minor errors** any combination of criteria for 5 marks	**6 marks** **mostly complete with some omissions** any combination of criteria for 6 marks	**7 marks** **close to complete and correct, a major error** any combination of criteria for 7 marks
Level 3 - exceptional understanding			
8 marks **close to complete and correct, minor errors** any combination of criteria for 8 marks	**9 marks** **almost complete and correct, trivial errors** any combination of criteria for 9 marks	**10 marks** **complete and correct, reflecting exceptional understanding** any combination of criteria for 10 marks	

Marker Notes:

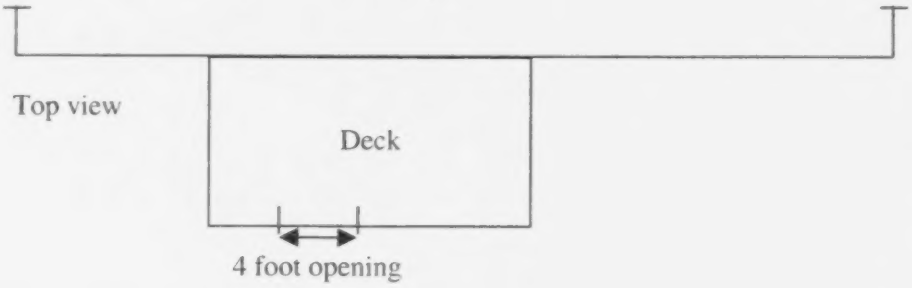
- *Maximum ½ mark deduction for each kind of technical communication error (not buying in whole units)*
- *If subtotals are given and taxes are done at end, award full marks.*

Marking Key
1 mark for consistently including taxes *1 mark for correct answer in a)* *1 mark for correct number of gallons for option A in b)* *1 mark for correct answer for Option A in b)* *1 mark for correct answer for Option B in b)* *1 mark for correct support of reason in c)* *1 mark for correct number of posts in d)* *1 mark for bracing boards in d)* *1 mark for spindles in d)* *1 mark for total amounts in d)*

Student exemplar 1

2. A deck attached to the back of a house is to be repaired by replacing the floor of the deck and by putting up new railings. The existing frame will be reused, and the new floor will be built on top.

Total: 10 marks



(1 mark) **GST and PST must be added to all costs.**

a) The floor of the deck is 16 feet by 8 feet. Sheets of plywood are to be used to form the floor of the deck. Each sheet of plywood measures 4 feet by 8 feet and costs $21.95. Determine the cost to replace the plywood.

(1 mark)

$16 \cdot 8 = 128 ft^2$ $8(4) = 32 ft^2$

$128 \div 32 = 4$

$4(\$21.95) = \$87.8$

$87.8(1.14) = \$100.09$

The plywood will cost $100.09

b) There are two options for protecting the floor from weather conditions.

(3 marks)

Option A: Treat the floor with a waterproof stain. One gallon will cover 45 square feet and the floor will require 2 coats. Each gallon costs $34.95.

Option B: Cover the floor portion of the deck with an outdoor carpeting that costs $1.69 per square foot.

Calculate the cost for each option.

Option A

$128 \div 45 = 2.8\overline{4}$

$3 \times 34.95 = 104.85$

$104.85 \times 1.14 = \$119.53$

Option A will cost $119.53

Option B

$128 \times 1.69 = \$216.32$

$216.32 \times 1.14 = \$246.6$

Option B will cost $246.60

c) Which option would you choose? Explain your choice.

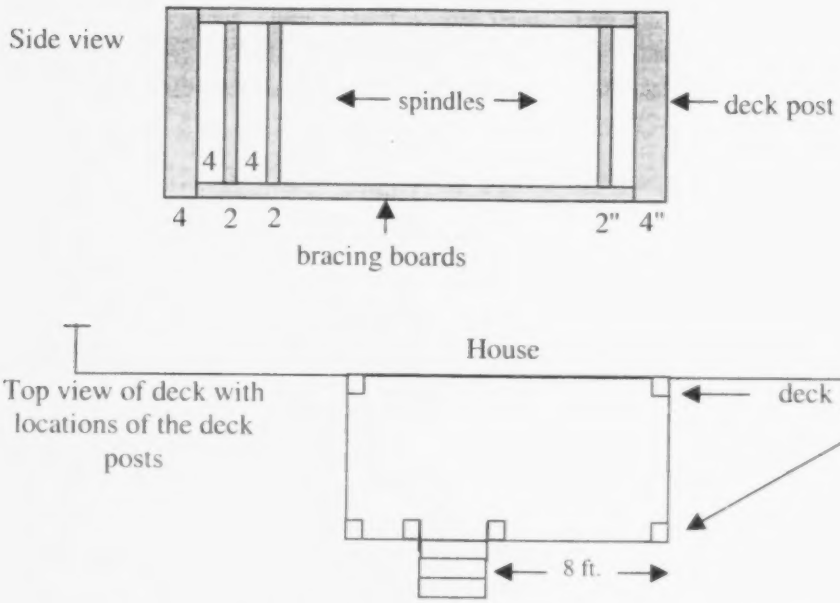
(1 mark)

Option A		Option B	
flooring	$119.53	flooring	$246.60
	$474.27		$601.34

I would choose option A because it is $127.07 cheaper

d) The sections of deck railing are built as shown below:

(4 marks)



- The deck posts are to be set at each corner of the deck and on each side of the opening of the deck. Each deck post is 4" wide.
- Each spindle is 2" wide and they are to be spaced 4 inches apart.
- The bracing boards are attached as shown above. They are sold only in 8 foot lengths.

The costs for the materials are:

- Deck posts are $4.59 each
- Bracing boards are $12.49 per 8 foot length
- Spindles are $1.55 each

Determine the total cost of the materials needed to build the deck railing around the deck.

6 x $12.49 = 74.94
6 x $4.59 = 27.54
78 x $1.55 = + 120.90
$223.38 (1.14) = $254.65

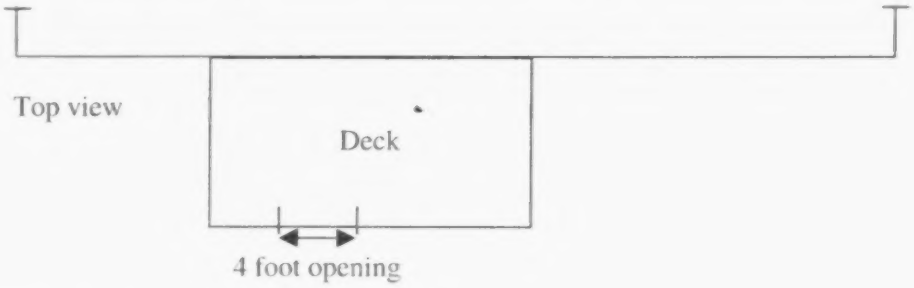
The cost is $254.65

5 marks

- 1 mark for calculating taxes
- 1 mark for correct answer in a)
- 1 mark for calculating option B in b)
- 1 mark for cost of deck posts in d)
- 1 mark for total cost in d)

2. A deck attached to the back of a house is to be repaired by replacing the floor of the deck and by putting up new railings. The existing frame will be reused, and the new floor will be built on top.

Total: 10 marks



(1 mark) **GST and PST must be added to all costs.**

a) The floor of the deck is 16 feet by 8 feet. Sheets of plywood are to be used to form the floor of the deck. Each sheet of plywood measures 4 feet by 8 feet and costs $21.95. Determine the cost to replace the plywood.

(1 mark)

4 x 21.95 = $87.80 (1.14)

Total Cost = $100.09

b) There are two options for protecting the floor from weather conditions.

(3 marks)

Option A: Treat the floor with a waterproof stain. One gallon will cover 45 square feet and the floor will require 2 coats. Each gallon costs $34.95.

Option B: Cover the floor portion of the deck with an outdoor carpeting that costs $1.69 per square foot.

Calculate the cost for each option.

Option A

8x16 = 128 sq. feet

128(2) = 256/45 = 5.69

need 6 gallons 6(34.95)(1.14) = $239.06

Option B

128 x 1.69 x 1.14

= $246.60

c) Which option would you choose? Explain your choice.

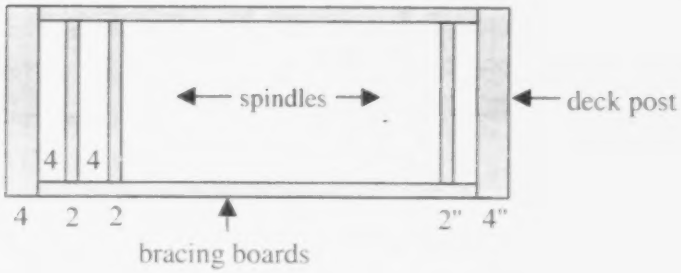
(1 mark)

I would choose option A. First of all, it is cheaper (but not by much) and it has other advantages. One being that the deck would be easier to clean with the treated wood than the outdoor carpet. Secondly, I think the treated wood would last longer than the carpet. The carpet could be prone to tears and rips.

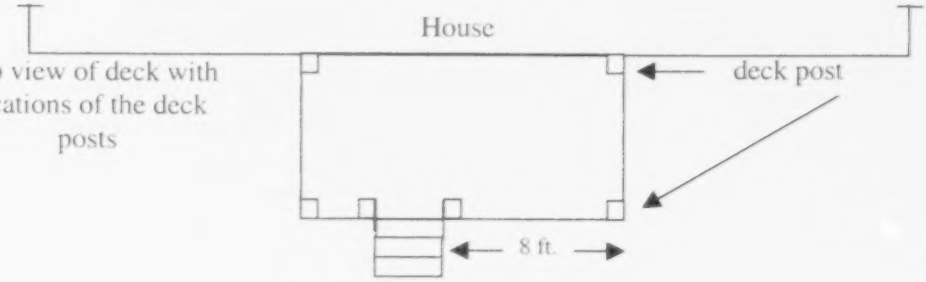
d) The sections of deck railing are built as shown below:

(4 marks)

Side view



Top view of deck with locations of the deck posts



- The deck posts are to be set at each corner of the deck and on each side of the opening of the deck. Each deck post is 4" wide.
- Each spindle is 2" wide and they are to be spaced 4 inches apart.
- The bracing boards are attached as shown above. They are sold only in 8 foot lengths.

The costs for the materials are:

- Deck posts are $4.59 each
- Bracing boards are $12.49 per 8 foot length
- Spindles are $1.55 each

Determine the total cost of the materials needed to build the deck railing around the deck.

Total Cost of deck repair

Option A 239.06 + 233.65 + 100.09
= $572.80

Option B 246.60 + 233.65 + 100.09
= $580.39

8'-8"
= 7'4"(3)
= 22 feet
4'-8"
= 3'4

Bracing Boards
→ need 25 feet 4 inches
∴ 4(8) bracing boards

Spindles
→ need 2 posts per foot
∴ 50 posts needed

Posts = 6

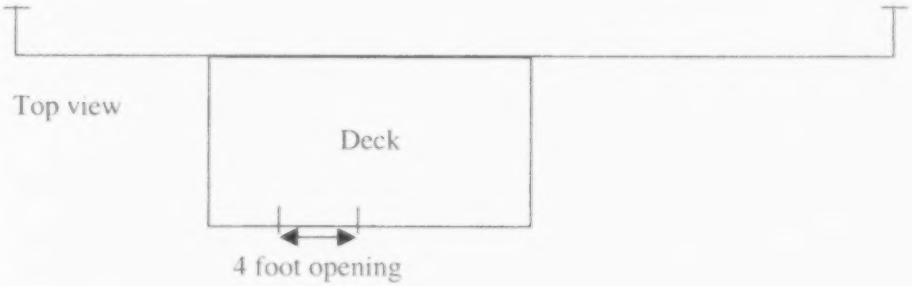
Totals = (8 x 12.49) + (6 x 4.59) + (50 x 1.55)
= 204.96(1.14) = $233.65

8 marks:

- 1 mark for taxes
- 1 mark for answer in a)
- 1 mark for correct gallons in b)
- 1 mark for answer in option A in b)
- 1 mark for answer in option B in b)
- 1 mark for correct answer in c)
- 1 mark for correct posts in d)
- 1 mark for total cost in d)

Total: 10 marks

2. A deck attached to the back of a house is to be repaired by replacing the floor of the deck and by putting up new railings. The existing frame will be reused, and the new floor will be built on top.



(1 mark) **GST and PST must be added to all costs.**

a) The floor of the deck is 16 feet by 8 feet. Sheets of plywood are to be used to form the floor of the deck. Each sheet of plywood measures 4 feet by 8 feet and costs $21.95. Determine the cost to replace the plywood.

(1 mark)

16x8=128
4x8=32
128÷32=4

4x21.95=$87.80 x1.14=$100.10

It will cost $100.10 to replace the plywood.

b) There are two options for protecting the floor from weather conditions.

(3 marks)

Option A: Treat the floor with a waterproof stain. One gallon will cover 45 square feet and the floor will require 2 coats. Each gallon costs $34.95.

Option B: Cover the floor portion of the deck with an outdoor carpeting that costs $1.69 per square foot.

Calculate the cost for each option.

This will cost $246.60 to complete.

ⓐ 128÷45 x2=5.69 x 34.95=198.83x1.14=$226.66

ⓑ 128x1.69=216.32x1.14=$246.60

c) Which option would you choose? Explain your choice.

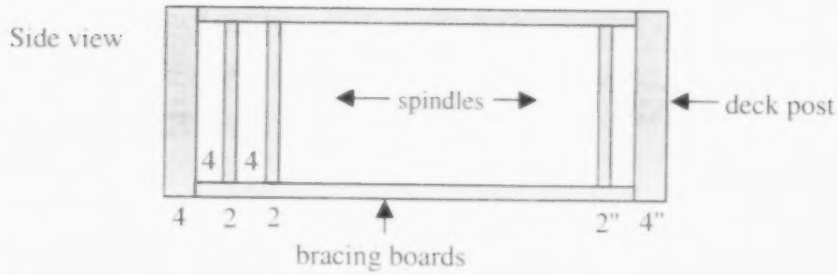
(1 mark)

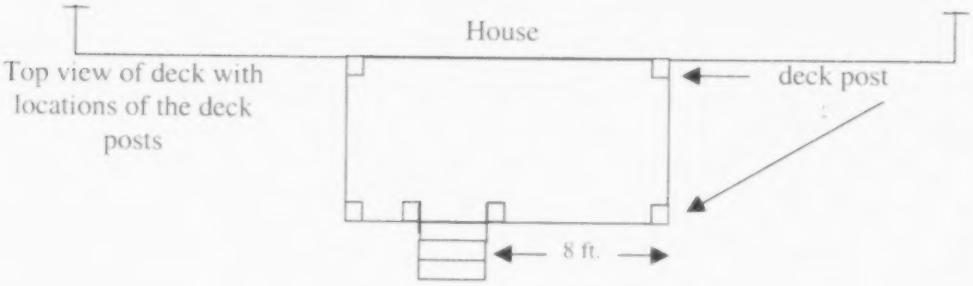
226.66 - 246.60 = $19.94

I would choose option A b/c i would save $19.94 on repairing the deck.

d) The sections of deck railing are built as shown below:

(4 marks)





- The deck posts are to be set at each corner of the deck and on each side of the opening of the deck. Each deck post is 4" wide.
- Each spindle is 2" wide and they are to be spaced 4 inches apart.
- The bracing boards are attached as shown above. They are sold only in 8 foot lengths.

The costs for the materials are:

- Deck posts are $4.59 each
- Bracing boards are $12.49 per 8 foot length
- Spindles are $1.55 each

Determine the total cost of the materials needed to build the deck railing around the deck.

4.59 x 6 = 27.54 x 1.14 = $31.40 deck posts
12.49 x 6 = 74.94 x 1.14 = $85.43 bracing boards

12 inches in a foot = 3 spindles per foot
2 inches per spindle = 2 spindles per foot
192 - 8 = 184 96 - 8 = 88 88 ÷ 2 = 44
88 x 2 = 176 + 184 + 44 = 404 ÷ 2 = 202 spindles
202 x 1.55 = 313.1 x 1.14 = $356.93 spindles
356.93 + 31.40 + 85.43 = $473.76 to build railing around deck.

7.5 marks:

- 1 mark for taxes
- 1 mark for a)
- 1 mark for gallons in b)
- 0.5 mark deduction for not buying in whole units
- 1 mark for option A answer for carried through error
- 1 mark for option B in b)
- 1 mark for support in c)
- 1 mark for posts in d)
- 1 mark for total based on previous errors in d)

Appendices

APPENDIX A
Table of Specific Outcome Match and Item Type

Multiple-choice items				
Question #	Key	Unit	Specific Outcome	Mark
1	C	A	1	1
2	D	A	2	1
3	C	B	1	1
4	B	D	2	1
5	B	D	5	1
6	A	E	1, 3	1
7	B	E	1	1
8	D	G	1	1
9	C	G	3	1
10	C	H	2, 3	1

Restricted-response items			
Question #	Unit	Specific Outcome	Mark
12	A	2	3
15	D	1	3
20	G	3	3
22	H	2	3
23	H	3	2

Restricted-response with explanation items			
Question #	Unit	Specific Outcome	Mark
11	A	2	4
13	B	2	3
18	E	1, 3	4
21	H	1	4
Inquiry 1	C	1, 2, 4	9

Open-response items			
Question #	Unit	Specific Outcome	Mark
14	B	3	6
16	D	3, 4, 5	4
17	E	1, 2, 3	4
19	G	1, 3	6
Inquiry 2	F	1–4	10

APPENDIX B

Generating Student Profiles

Profile of Test Score by Question Type

Item Type	Test Items	Total	÷ Maximum	× 100	= %
Multiple-choice	1 to 10: ____		10		
Restricted-response	12 ____, 15 ____, 20 ____, 22 ____, 23 ____		14		
Restricted-response with explanation	11 ____, 13 ____, 18 ____, 21 ____, Inquiry 1 ____		24		
Open-response	14 ____, 16 ____, 17 ____, 19 ____, Inquiry 2 ____		30		

Profile of Test Score by Curriculum Unit

Unit	Test Items	Total	÷ Maximum	× 100	≐ %
Matrices	1 ____, 2 ____, 11 ____, 12 ____		9		
Vectors	3 ____, 13 ____, 14 ____		10		
Personal Finance	Inquiry 1 ____		9		
Probability	4 ____, 5 ____, 15 ____, 16 ____		9		
Variability and Statistics	6 ____, 7 ____, 17 ____, 18 ____		10		
Design and Measurement	Inquiry 2 ____		10		
Periodic Functions	8 ____, 9 ____, 19 ____, 20 ____		11		
Sequences	10 ____, 21 ____, 22 ____, 23 ____		10		

APPENDIX C—Sheets for marking the Inquiry Tasks

Inquiry Task 1: Personal Finance		**Booklet Numbers**				
1 mark for work shown indicating an appropriate strategy						
a	*1 mark for correct answer in a)*					
b	*1 mark for correct answer in b)*					
c	*1 mark for correct payment in c)*					
	1 mark for correct future value in c)					
d	*1 mark for correct payment in d)*					
	1 mark for correct future value in d)					
e	*1 mark for 1st appropriate reason in e)*					
	1 mark for 2nd appropriate reason in e)					
	Totals					

Inquiry Task 1: Personal Finance		**Booklet Numbers**				
1 mark for work shown indicating an appropriate strategy						
a	*1 mark for correct answer in a)*					
b	*1 mark for correct answer in b)*					
c	*1 mark for correct payment in c)*					
	1 mark for correct future value in c)					
d	*1 mark for correct payment in d)*					
	1 mark for correct future value in d)					
e	*1 mark for 1st appropriate reason in e)*					
	1 mark for 2nd appropriate reason in e)					
	Totals					

Use check marks (✓) to tally students' marks on the question

Inquiry Task 2: Design and Measurement		Booklet Numbers				
1 mark for consistently including taxes						
a	*1 mark for correct answer in a)*					
b	*1 mark for correct # of gallons for option A in b)*					
b	*1 mark for correct answer for Option A in b)*					
b	*1 mark for correct answer for Option B in b)*					
c	*1 mark for correct support of reason in c)*					
d	*1 mark for correct number of posts in d)*					
d	*1 mark for bracing boards in d)*					
d	*1 mark for spindles in d)*					
d	*1 mark for total amounts in d)*					
	Totals					

Inquiry Task 2: Design and Measurement		Booklet Numbers				
1 mark for consistently including taxes						
a	*1 mark for correct answer in a)*					
b	*1 mark for correct # of gallons for option A in b)*					
b	*1 mark for correct answer for Option A in b)*					
b	*1 mark for correct answer for Option B in b)*					
c	*1 mark for correct support of reason in c)*					
d	*1 mark for correct number of posts in d)*					
d	*1 mark for bracing boards in d)*					
d	*1 mark for spindles in d)*					
d	*1 mark for total amounts in d)*					
	Totals					

Note: Maximum ½ mark deduction for each type of technical communication error (not buying in whole units)

Use check marks (✓) to tally students' marks on the question